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ABSTRACT

This booklet, developed by the Oregon Vo-Tech Math Project, contains a series of mathematical problems related to vocations in agriculture. The mathematical topics on which problems are based include whole numbers; fractions; decimals; percent; use of formulas; charts and graphs; ratio and proportion; solution of equations; perimeter, area, and volume; right angle trigonometry; and logarithms. Solutions are provided for all problems. (SD)

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Applied Math Problems in

Agriculture

Oregon Vo-Tech Mathematics Problem Sets

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942 LANCASTER DRIVE N.E.
SALEM, OREGON 97310

VERNE A. DUNCAN
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ORIGINAL DEVELOPMENT TEAM

Project Director:
Dell Swearingen
Linn-Benton Community College

Ex-Director:
Galen Nielsen
Linn-Benton Community College

Writers-Community College

John Anderson
Ted Boyll
Richard Claudson
Bud Cook
Kay Elling
Bobby Finnell
Don Gallagher
Harold Hauser
Frank Holliday
Henry Lind
Mike Morgan
Harrison Platt
Merlin Salter
Ken Thomason
Frank Weeks

Writers-High School
Gene Enfield
Al Hendricksen
Woody LaSueur
Bill Rino

Editor:
Norma Cosler

Assistant Editors:
Bob Mack
Mike Long

Graphic Artist:
Rose Davis

Host Institution:
Linn-Benton
Community College

SECOND YEAR TEAM

Project Director:
Dell Swearingen

Coordinator:
Harold Hauser

Jerald McBee
Richard Dow
Robert Goff
Robert Larson
Lon Kongflie
Kent Hansen
Melba Hauser, typist
Linda Cooper, student
aide
Mary Jane Simpson,
student aide

Host Institution:
Blue Mountain
Community College

Applied Mathematics

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Agriculture

WHOLE NUMBERS
Level 1

Agriculture

1. At \$475.00 per acre what is the value of a 2,750 acre ranch?
2. During the year Mr. Goss had the following income and expenses. Find the total of each and his profit.

Income:

Milk sales	\$63,409
Crop sales	21,564
Hog sales	3,674
Custom work	1,800
Inventory increase	5,102
Farm privileges	150

Expenses:

Machinery	\$31,340
Interest	5,864
Repairs	10,103
Gas & Oil	8,115
Hired labor	7,000
Seed	534
Fertilizer	2,856
Feed	9,304
Depreciation	2,100

3. We have the following weights for 6 steers; 878 lbs., 907 lbs., 838 lbs., 1010 lbs., 1113 lbs. and 930 lbs. a). What is the average weight? b). If 3,072 lbs. of feed is consumed in 32 days, what is the feed consumption per day per steer? c). If the total gain was 576 lbs., what is the average daily gain per steer?
4. A tank of fuel holds 540 gallons. Each day 3 tractors using 15 gallons of fuel will be filled from it, how many days would be the maximum between fillings of the large tank?
5. Mr. Goad made a stack of baled hay 5 bales wide, 124 bales long and 10 bales high. If the bales average 80 lbs. per bale, how many ton of hay are in the stack?
6. A foreman was told to spend not over \$1,450. on baling twine. Each ball of twine costs \$12.00, how many balls of twine could he buy and how much money was left over?

WHOLE NUMBERS
Level 1

Agriculture

7. Using the price of 29¢/ft², find the cost of a concrete driveway that is 124 ft. long and 8 ft. wide.
8. Compute the number of cwt (hundred weight) of wheat held by a truck grain box measuring 30 ft. long, 8 ft. wide and 5 ft. deep when it is level full. (1 ft.³ of wheat weighs 48 lbs.)
9. You are feeding out a pen of 100 steers, you weighed them yesterday and got the following figures.

Feeding period	32 days	
Total gain	9,600 pounds	(for feeding period)
Total feed	67,200 pounds	(for feeding period)
Feed cost is 6¢ per pound		

Please figure the following:

- Average daily gain per steer
- Feed consumption per day per steer
- Cost per head per day
- Cost per pound gained
- Feed ratio (feed to gain)

Level 2

10. The annual depreciation using the straight line method on a \$20,500 tractor with a 10 year life and a \$2,500 salvage value would be how many dollars?
11. What would be the total expected cost of a 60 hp wheel tractor with an estimated new cost of \$18,700 and an expected life of 14,000 hours with fuel cost being \$2.00 per hour and repairs \$1.00 per hour of operating time?

WHOLE NUMBERS
Level 2

Agriculture

12. A gallon of oil has a volume of 231 cubic inches. If a drum held 55 gallons of oil, what is the volume of the tank in cubic inches?
13. One man with a two-horse team can cultivate 9 acres of corn a day. With a tractor and an 8-row cultivator he can cover 126 acres a day. How many men and horses would it take to do the work of one tractor?
14. How many chicks can be brooded under a rectangular hover measuring 8 ft. x 10 ft., allowing 10 in² /chick?
15. A rancher has a pickup truck which weighs 4,000 lbs. empty and is licensed to GVW 5,000 lbs. On one trip he brings home 10 bushel of bran, how many bushel of oats does he bring to complete his legal load? (1 bushel barley = 48 lbs., 1 bushel bran = 20 lbs., 1 bushel oats = 32 lbs.)

FRACTIONS
Level 1

Agriculture

1. Compute the number of board feet in 18 boards which are 2 inches x 8 inches x 16 feet long. Use the formula:

$$\text{Board feet} = \frac{\left(\begin{array}{c} \text{No. of} \\ \text{boards} \end{array} \right) \left(\begin{array}{c} \text{thickness} \\ \text{in inches} \end{array} \right) \left(\begin{array}{c} \text{width in} \\ \text{inches} \end{array} \right) \left(\begin{array}{c} \text{length in} \\ \text{feet} \end{array} \right)}{12}$$

2. A 150 ft. roll of 60-inch poultry fencing of a name-brand weighs $53 \frac{1}{3}$ lbs. Estimate the total number of feet of fencing contained in 4 partially used rolls weighing $27 \frac{1}{4}$ lbs., $19 \frac{1}{2}$ lbs., 8 lbs. and $34 \frac{3}{4}$ lbs.
3. What fraction of an acre is a plot of ground $653 \frac{1}{3}$ feet long and $3 \frac{1}{3}$ feet wide? (40-inch row width)
4. Under range conditions $21 \frac{1}{2}$ pounds of salt are needed for each cow during a year. Each calf needs $\frac{3}{7}$ as much as a cow. If you have a herd of 1,214 cows with calves and 714 cows without calves, how much would salt cost for a year, if you can buy it at $12 \frac{2}{3}$ dollars per ton?
5. The outside dimensions of a field are $\frac{1}{5}$ mile by $\frac{3}{4}$ miles. You make 5 trips around the field with a ground application spray rig that has a spray boom swath width of $25 \frac{3}{4}$ ft. How many acres have you covered? Assume no overlap.
6. A leghorn laying hen requires about 35 lbs. of mash costing \$7.80 per hundred weight and 50 lbs. of grain costing \$6.00 per hundred weight each year. If labor costs are estimated to be $\frac{1}{3}$ as much as the feed cost and assuming that the owner will receive 60¢ per dozen for the eggs, what should the average annual production of eggs be in order for a flock of 10,000 birds to yield a gross profit equal to $\frac{1}{4}$ of the owners investment in feed and labor?

FRACTIONS
Level 2

Agriculture

7. A $24 \frac{1}{2}$ lbs. strip of bacon was bought at 56¢ a pound and sold sliced, without rind, at 98¢ a pound. What was the profit if the weight of the rind was $\frac{1}{7}$ the weight of the strip?
8. An uncultivated fence line $4 \frac{1}{8}$ feet wide and one mile long provides what fraction of an acre of wildlife cover?
9. Compute the number of board feet in the following order.
10, 1 inch by 8 inch boards 12 ft. long
24, 2 inch by 4 inch boards 16 ft. long
8, 2 inch by 8 inch boards 12 ft. long
2, 4 inch by 6 inch boards 3 ft. long
10. It is estimated that $13 \frac{1}{4}$ kw-hr of electricity are required to incubate 100 eggs. At $3 \frac{3}{8}$ ¢ per kilowatt-hour find the cost of the energy required to incubate the 100 eggs.
11. Find the annual depreciation, using the sum-of-the-years-digits method, of a \$20,500 tractor with 10 year life and a \$2,500 salvage value.
Annual depreciation is determined by multiplying a calculated fraction times the original cost minus salvage value. (The calculated fraction is determined by adding the number of useful years for the denominator and considering the number of years remaining for depreciation as the numerator.)
12. Assuming that skim milk used for feeding purposes is worth half as much per 100 lbs. as corn is per bushel, what would be the value of 1,600 lbs. of skim milk when corn is worth \$2.89 per bushel?
13. A storage frame which is one four-thousandths of an acre in size measures 3 feet in width by how many feet in length?

DECIMALS
Level 1

Agriculture

1. A steer whose live weight was 1,120 lbs. , dressed out at 684 lbs. The dressed weight was what part of the live weight? Express the result as a decimal to the nearest hundredth.
2. How many acres can be plowed in 10 hours by a tractor traveling 6 mph and pulling five 16 inch bottoms? (Assume 0.05 lost time with a moldboard plow.)
3. If 14,386 lbs. of cotton lint are produced on 34.2 acres, what is the yield per acre? Express to the nearest hundredth of a pound.
4. Calculate the weight of wheat in a full truck that is 20.2 feet long, 6.9 feet wide and 4.3 feet high. How many bushels would it hold?
5. If a man wants to apply 20 gallons per acre of spray and he can cover 0.24 acres per minute, what should be the discharge rate in gallons per minute?
6. In fertilizer used on corn land, 0.425 of the mixture is cottonseed meal, 0.45 is phosphoric acid and the rest is kainit. How many pounds of each are there in a ton of the fertilizer?
7. If the length of the sides of a four sided field are 478.3 ft., 597.6 ft., 392.1 ft. and 801.9 ft., what will it cost to fence the field at \$1,435 per rod? How many posts will it take if none are placed more than 16 feet apart?

DECIMALS
Level 1

Agriculture

8. In tests to compare net returns from calves, yearlings and 2-year-olds, the following data was found:

	Calves	Yearlings	2-year-olds
Gain per day	2.19 lbs.	2.26 lbs.	2.40 lbs.
Days fed	197	174	162
Feed cost/100 lbs grain	\$27.14	\$28.96	\$29.14
Selling price	\$38.32	\$38.08	\$38.14
Purchase cost/100 lbs.	\$40.00	\$38.38	\$38.50
Purchase weight	754 lbs.	843 lbs.	985 lbs.

Find the net return from each.

Level 2

9. It is necessary to pump 4.2 acre-feet of water each day into an irrigation reservoir 175 feet above the river. If we assume no friction or other losses in the process, what will be the minimum power required to do this job?
(1 hp = 33,000 ft-lb/min.; 1 acre-foot = 325,900 gallons; 1 gallon = 8.35 lbs.)
10. A truck bed is 8 ft. by 14 ft. by 6 ft. in size. The driver goes to Portland loaded level (full) with wheat. On the return trip he brings back an equal weight of plywood having a specific gravity of 0.78. He can therefore bring back how many pieces of 4 ft. by 8 ft. by 1 in. plywood?
(1 bushel of wheat weighs 60 lbs.; 1 bushel = 0.8036 cu.ft.)
11. A Leghorn laying hen requires 35 lbs. of mash and 50 lbs. of grain per year. With mash costing \$9.00 per hundredweight and grain cost-

Continued on page 8

11. Continued.

ing \$7.86 per hundredweight, how many eggs worth 68¢ per dozen must a hen lay in a year to pay for her feed bill?

12. It is estimated that 635 lbs. of shelled corn will produce 100 lbs. of live weight pork or that a combination of 275 lbs. of shelled corn, 35 lbs. of tankage and 20 lbs. of cottonseed meal will produce the same weight. If shelled corn is worth \$7.23 per hundredweight, tankage is worth \$13.00 per hundredweight and cottonseed meal is worth \$9.00 per hundredweight which would be the most economical feed? How much would you save in cost per hundred pounds of live weight gain?

13. The following mixture of feeds makes 1,000 lbs. of a standard baby chick ration:

<u>Ingredients</u>	<u>Cost/lb.</u>
325 lbs. ground yellow corn	\$0.065
275 lbs. gray wheat shorts	\$0.096
100 lbs. ground oats	\$0.092
80 lbs. dried buttermilk	\$0.175
70 lbs. meat scraps	\$0.123
50 lbs. cottonseed meal	\$0.078
40 lbs. alfalfa leaf meal	\$0.082
34 lbs. bran	\$0.053
15 lbs. finely ground shell	\$0.020
10 lbs. salt	\$0.010
1 pint triple strength cod liver oil	\$7.30 per gal.

This same feed can be bought ready-mixed at \$11.25 per hundredweight. Disregarding the cost of labor, how much can the farmer save per ton by mixing instead of buying the ready-mixed?

DECIMALS
Level 2

Agriculture

14.	<u>Tractor</u>	<u>Fuel</u>	<u>H.P.</u>	<u>Gal/hr.</u>	<u>Cost/gal.</u>
	1	Gas	61.25	6.704	43.8¢
	2	Propane	61.73	8.615	32.6¢
	3	Diesel	61.92	5.109	36.5¢

Using the tractors listed above, find (a) the HP-hr/gallon, (b) lbs./HP-hr., (c) cost/hr. of operating time and (d) the percent thermal efficiency for each.

15. What is the cost of the wire for 3,000 ft. of five strand barbed wire when the wire is selling at \$13.50 per 80 rod spool or \$11.75 each in lots of ten or more spools? What part of a spool would remain as surplus?

PERCENTAGE
Level 1

Agriculture

1. How many lbs. of 9-30-0 (9 %N; 30 % P_2O_5 , K_2O) should one apply to an acre to have an application of 85 lbs. of P_2O_5 ?
2. 8 lbs. of 50 % Igran wettable powder were mixed with 100 gallons of water. What percent Igran was in the spray?
3. The recommended fertilizer treatment for a certain 40 acre field is 80 lbs. of Nitrate, 70 lbs. P_2O_5 and 40 lbs. K_2O . (a) How many tons of Ammonium Nitrate 33.5 %N do we need? (b) How many tons of 0-20-20 and super phosphate 20 % P_2O_5 do we need?
4. If a cow needs 2.1 lbs. of protein feed per day. How many lbs. of 8 % protein feed will she need?
5. In conducting a germination test on seed corn a farmer found that 234 grains out of a total of 257 germinated. What percent germinated?
6. How many tons of ammonium nitrate (53.5 %N) will I need for an application of 60 lbs. per acre of Nitrogen on a 275 acre field?
7. (a) Which is the cheaper source of total digestable nutrients, barley (78.9 % T.D.N.) at \$4.97/cwt, or corn (82.7 % T.D.N.) at \$5.12/cwt?
(b) How much cheaper is it per pound of T.D.N.?
8. How many lbs. of 59 % Taxaphene wettable powder are needed to make 100 gallons of spray containing 0.25 % Taxaphene?

PERCENTAGE
Level 1

Agriculture

9. A tractor listed at \$20,000 is on sale at 25 % discount. What is the buyer's cost for the tractor when a cash discount of 5 % is also obtained?
10. We have 250 steers with average weight of 980 lbs. (a) What is the total selling price at 48¢ a pound based on average weight? (b) What is the total selling price at 3 % shrink? (c) If carcass weight is 60 % of live weight, what will be the total carcass price at 89¢ per lb. of hanging weight?
11. The recommended fertilizer treatment for a 140 acre field is 90 lbs. N., 100 lbs. $P_2 O_5$ and 40 lbs. $K_2 O$. There are 20 tons of 10-10-10 (which should be completely used up), 10 ton of ammonium nitrate, 32 %N., 10 ton of super phosphate (20 % $P_2 O_5$) and 8 ton of 0-30-20 on hand. (a) How many tons of each type fertilizer are needed? (b) To what rate should the fertilizer distributor be set to apply the mixture? (c) What would be the rates if each fertilizer is applied separately?

Level 2

12. If 10,870 pounds of shelled corn containing 32.5 % moisture are harvested per acre, how many bushels per acre adjusted to 15.5 % moisture were harvested?
13. On a tract of land having a 7 % slope the vertical interval between two terraces is $8 \frac{3}{4}$ feet. How far apart horizontally are the terraces? (Slope, when expressed as a percent, is the number of feet of fall per 100 ft. of horizontal distances.)
14. In a daily ration for ewes, consisting of $3 \frac{3}{4}$ lbs. of alfalfa and $2 \frac{1}{4}$ lbs. corn silage, what percent of the ration is alfalfa?

**PERCENTAGE
Level 2**

Agriculture

15. How much is freshly cut alfalfa with a 59 % moisture content worth, compared to baled alfalfa (selling at \$73. per ton) which has a 14 % moisture content?

RATIO AND PROPORTION
Level 1

Agriculture

1. Soil bulk density is 1.56. What is the weight of one acre inch of this soil if water weighs 62.4 lbs. per cubic foot?
2. If 1 gallon, 3 quarts, 1 pint of spray is applied to 0.4 acres, what is the rate of application in gallons per acre?
3. How many pounds of fertilizer should be applied to a rectangular garden measuring 80 ft. x 75 ft., if the recommended rate of distribution is 560 lbs. per acre?
4. Allowing 6.8 lbs. of concentrate per pound of gain, how many tons of concentrate would be needed to put 540 lbs. of gain on 250 head of cattle?
5. If $1\frac{1}{2}$ ft.³ of cement, $2\frac{3}{4}$ ft.³ of sand and $6\frac{1}{4}$ ft.³ of gravel are needed to make 8 ft.³ of concrete, how much of each would be needed to make 125 ft.³ of concrete?

Level 2

6. How fast would a silage blower with a 8 inch pulley be operating when connected to a 5 inch pulley on a P.T.O. turning at 1,600 rpm?
7. If a certain cylindrical tank is known to hold 1,000 gallons when full, what is the capacity of a similar tank of the same length and twice the diameter?
8. One of two meshing spur gears on adjoining shafts has 24 teeth and the other has 16 teeth. How fast is the 16 tooth gear turning when the 24 tooth gear is making 1,800 rpm's?

RATIO AND PROPORTION
Level 2

Agriculture

9. What size gear is needed to turn the reel on a harvester at 24 rev/min. when it is driven by a chain on a 18 tooth power gear turning at 120 rev/min.?
10. A planter plate turns $1/2$ revolution for each revolution of the ground wheel. The ground wheels have an effective circumference of 80 inches, the plate has 16 edge drop cells. What is the spacing in the row for drilled corn?
11. Two machine pulleys, 18 inches and 5 inches in diameter, respectively, are connected by a belt. Find the speed of the smaller when the larger is making 270 rpm's. (The ratio of their speeds is equal to the inverse ratio of their diameters.)
12. If a beef animal that is fed a daily ratio of 2.1 lbs. of cottonseed meal, 8 lbs. of corn and 12 lbs. of prairie hay gains 2.4 lbs. daily, how much of each of these feeds should be required to produce 1,000 lbs. of live weight?
13. How much Stilbestrol (synthetic hormone) should be added to a ton of beef ration to insure 10 mg/head/day when each animal is fed 25 lbs. of ration per day?

TRADE FORMULAS
Level 1

Agriculture

1. A repairman uses a white mark on the side of a tractor tire to enable him to count the number of revolutions of the wheel and thus measure distance traveled in a field. The tire on this tractor has an effective radius of 2.7 feet. How many turns of the wheel would equal a distance of 100 feet?
2. Sugar beets are thinned to 10 inch spacing in a 22 inch row. Calculate the number of plants per acre.
3. Calculate the cost of concrete needed to pour a 3 inch floor in a shed 60 feet long and 28 feet wide. Concrete costs \$8.00 per cubic foot. Use a 3 % margin.
4. (a) Find the number of acres covered by a center pivot sprinkling system which has a radius of 1,500 feet. (b) How many gallons would be needed to apply 3 inches of water to this area?
5. A skid tank for use in a farmers truck measures five feet in diameter and is 10 ft. long. If this is filled to 85 % capacity with a liquid fertilizer that weighs 9.2 pounds per gallon, what is the weight of the contained fertilizer?
6. Find the area of a roof on a shed whose width is 24 feet and center height is 5 feet if the length is 60 feet. (Assume the roof has a 1 foot overhang.)

Level 2

7. A soil lab reports an available nutrient at a level of 21 parts/million. How many pounds per acre foot is this in a soil that weighs 65 pounds per cubic foot?

TRADE FORMULAS
Level 2

Agriculture

8. A glass house is 80 ft. long and 24 ft. wide, with sides 8 ft. high and the roof gable 6 ft., above the walls. How many smoke bombs of 5,250 cu.ft. capacity will be needed to fumigate the building? (Round off to the nearest whole number.)
9. A hog trough with a triangular cross section measures $15 \frac{1}{4}$ inches across the top, $7 \frac{3}{4}$ inches in depth and 12 ft. in length (inside measurement). How many gallons of slop will it hold?
10. How much water would have to be pumped through a sprinkler set on a 80 ft. x 100 ft. spacing to apply 0.4 inches per hour?
11. Calculate the load in tons of a grain truck 20 feet long with end shape of a trapezoid whose dimensions are 12 feet upper width, 8 feet deep and lower width 2 feet.
12. A cylindrical grain storage bin is 12 feet in diameter, and 20 feet high. If it is initially empty, how many minutes will it take to fill the bin if the auger delivers 13 bu/min.?
13. Calculate the cost to cover a tepee 14 feet high with canvas if the base has a 22 foot diameter. Canvas costs \$4.00 per square yard.

SIMPLE EQUATIONS

Agriculture

Level 1

1. How many pounds of 35 % super phosphate should be used with a ton of 4-8-4 fertilizer to raise the phosphoric acid content to 18 %?
2. A tractor which has a 24 quart radiator is now filled with 15 % anti-freeze, how many quarts of pure antifreeze must be added to make a mixture of 50 % antifreeze?

Level 2

3. We need 100 lbs. of 14 % digestible protein feed. We have 100 lbs. of 7 % digestible protein feed and 100 lbs. of 17 % digestible protein feed. How many lbs. of each do we need to use to obtain the 14 % protein feed?
4. Determine the three largest whole numbers proportional to 2,3,1 representing, respectively, the amounts of nitrogen, phosphoric acid, and potash obtained for a fertilizer formed from cyanamid testing 32 % nitrogen superphosphate, testing 35 % phosphoric acid, and muriate of potash testing 40 % potash, for one ton fertilizer.
5. Mr. Smith has two feeds, one feed contains 5 % digestible protein the other contains 19 % digestible protein. How much of each should Mr. Smith use to have 100 lbs. of feed mixture containing 13 % digestible protein?
6. How many pounds of cream testing 42 % butterfat must be added to 2,000 lbs. of 3.5 % butterfat milk to make a 12 % butterfat cream?
7. If corn is worth \$3.94 per bushel and hogs worth 38¢ per pound of live weight, how many bushel of corn are equal in value to 100 lbs. of live weight hogs?

SIMPLE EQUATIONS
Level 2

Agriculture

8. How many pounds of air dried alfalfa testing 64 % moisture must be delivered to a mechanical drier to obtain a ton of hay testing 9 % moisture?
9. Melba has two feeds. One feed contains 8 % digestible protein while the other contains 23 % digestible protein. How much of each feed should she use to have 100 lbs. of feed mixture containing 8.5 % digestible protein?
10. Determine the three largest whole numbers proportional to 4, 5, 2, representing, respectively, the percents of nitrogen, phosphoric acid, and potash, obtained for a fertilizer formed from cyanamid testing 26 % nitrogen super phosphate, testing 30 % phosphoric acid, and muriate of potash testing 24 % potash.

CHARTS AND GRAPHS
Level 1

Agriculture

1. From the following data make a curve graph showing how the velocity of water flowing from a nozzle varies with pressure.

Pressure (lbs./sq.in.)	10	20	30	40	50	60	70
Velocity (ft./sec.)	38.6	54.6	66.9	77.2	86.3	94.5	102.1

2. The number of cattle of different weights that may be shipped in a railroad livestock car 48 ft. long are:

Average wt.(lbs.)	300	400	500	600	700	800	900	1000
No. of head	80	67	56	49	44	40	36	33

Draw a line graph, then determine the number of 420 lb. calves that could be shipped in a railroad livestock car.

3. A feed lot has an average of 8,450 steers and 5,600 lambs. The steers average 950 lbs. and the lambs 85 lbs. Using table number 1, how many tons of (a) nitrogen, (b) phosphorus, and (c) potassium would be produced per year?

Table 1. Average composition of ton of manure

Animal	Nitrogen (lbs.)	Phosphorus (lbs.)	Potassium (lbs.)	Tons Produced/Year/ 1,000 lb. Animal Weight
Dairy Cow	10.7	2.1	9.4	15.0
Steer	14.6	4.2	9.2	8.5
Sheep	21.5	6.3	22.0	7.5
Horse	14.0	2.2	12.8	9.0
Pig	9.8	3.0	7.8	18.0
Hen	22.6	7.6	7.6	4.3

PULL-SLIP-HORSEPOWER CHARACTERISTICS

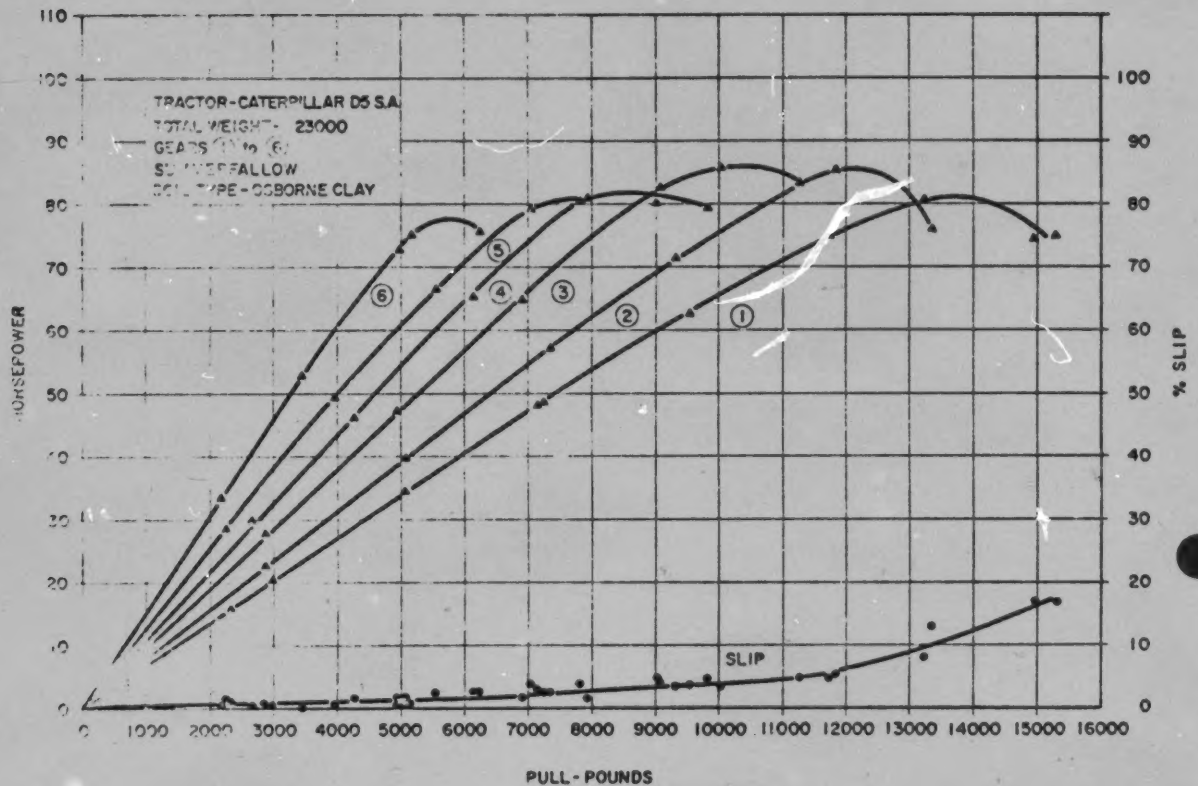


FIGURE 2.

4. Using Figure 2, above, complete the following:
- the horsepower generated in second gear for 9,000 lbs. pull
 - the horsepower generated in first gear for 4,000 lbs. pull
 - the percent slip at 11,000 lbs. pull
 - the percent slip at 6,000 lbs. pull
 - the maximum horsepower generated in third gear

PULL-SLIP-HORSEPOWER CHARACTERISTICS

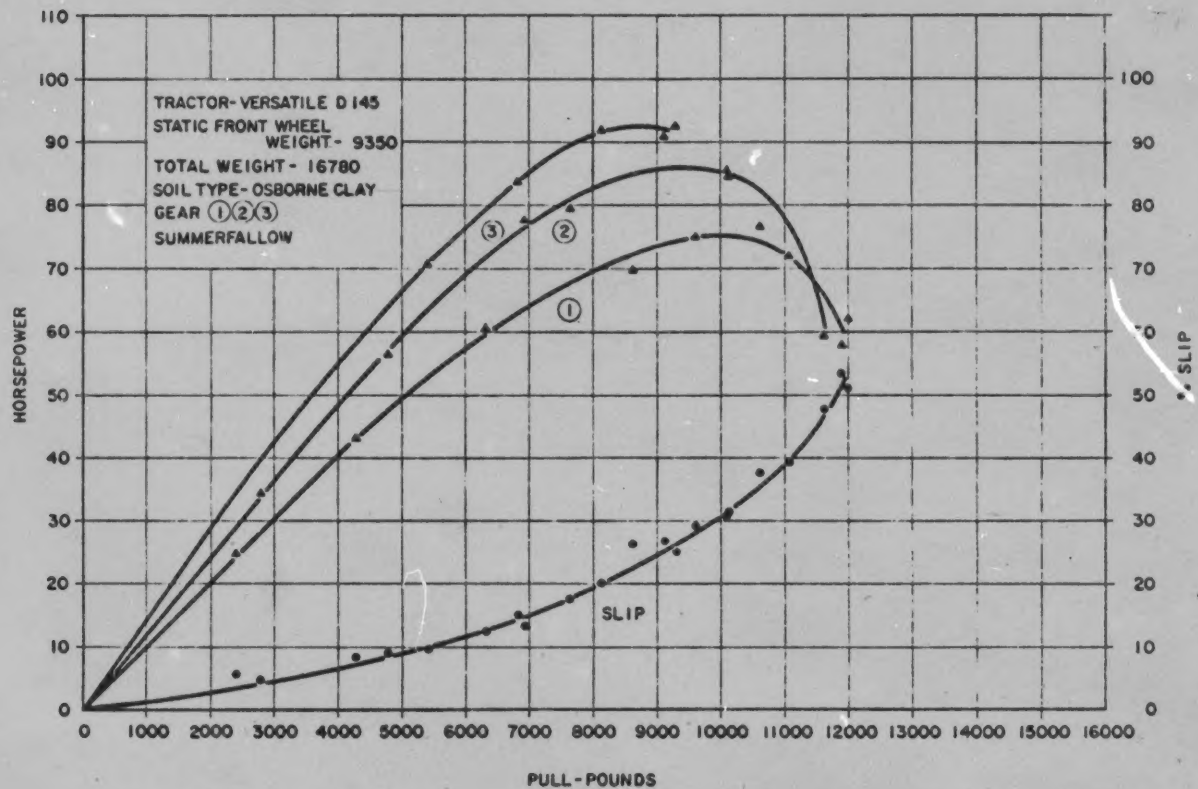


FIGURE 3

5. Using Figure 3, above, complete the following:
- the horsepower generated in second gear for 9,000 lbs. pull
 - the horsepower generated in first gear for 4,000 lbs. pull
 - the percent slip at 11,000 lbs. pull
 - the percent slip at 6,000 lbs. pull
 - the maximum horsepower generated in third gear

CHARTS AND GRAPHS
Level 1

Agriculture

6. How much nitrogen, phosphate, and potash would be removed from the soil per acre with the following crops: (Use Table 4, page 23)
- (a) wheat: 40 bu. grain and 1.5 ton straw
 - (b) corn: 150 bu. grain
 - (c) double crop of: shelled peas 4,800 lbs. and sorghum 58 bu. grain
7. Using Tables 5 and 6 would the following be a balanced ration for 100, 50 pound fattening pigs? (check dry matter, digestible protein, T.D.N.)

Ration

250 lbs. shelled corn
50 lbs. tankage
20 lbs. alfalfa meal

320 lbs. total

Table 4. Removal of nutrients of various crops

			Lbs. of Plant Food Removed				
Crops		Yield/Acre	(N)	(P ₂ O ₅)	(P)	(K ₂ O)	(K)
<u>Grains</u>							
Barley	(grain)	40 bu.	35	15	7	10	8
	(straw)	1 ton	15	5	2	30	25
Corn	(grain)	100 bu.	90	35	15	25	21
	(stover)	3 tons	60	25	11	95	79
Oats	(grain)	80 bu.	50	20	9	15	12
	(straw)	2 tons	25	15	7	80	66
Rye	(grain)	30 bu.	35	10	4	10	8
	(straw)	1.5 tons	15	8	3	25	21
Sorghum	(grain)	60 bu.	50	25	11	15	12
	(stover)	3 tons	65	20	9	95	79
Soybeans	(grain)	40 bu.	150	35	15	55	46
	(straw)		50	15	7	20	17
Wheat	(grain)	40 bu.	50	25	11	15	12
	(straw)	1.5 tons	20	5	2	35	29
<u>Hay</u>							
Alfalfa		4 tons	180	40	18	180	150
Bluegrass		2 tons	60	20	9	60	50
Red Clover		2.5 tons	100	25	11	100	83
Soybean		2 tons	90	20	9	50	41
Timothy		2.5 tons	60	25	11	95	79
<u>Fruits and Vegetables</u>							
Apples		500 bu.	30	10	4	45	37
Beans, lima (shelled)		2,000 lbs.	60	15	7	30	25
Beans, snap (pods)		4,000 lbs.	100	10	4	15	12
Cabbage		20 tons	130	35	15	130	108
Onions		7.5 tons	45	20	9	40	33
Peas (shelled)		3,000 lbs.	30	10	4	15	12
Potatoes (tubers)		400 bu.	80	30	13	150	125
Spinach		5 tons	50	15	7	30	25
Sweet Corn (ears)		5 tons	35	20	9	15	12
Tomatoes		15 tons	90	30	13	120	100
<u>Other Crops</u>							
Sugar beets (roots)		15 tons	60	20	9	50	41
Tobacco (leaves)		1,500 lbs.	55	10	4	80	66
	(stalks)		25	10	4	35	29

Plant removals by yields lower or higher than those indicated here are proportionate to one another. For instance, 2 tons of alfalfa will remove 20 pounds of P₂ O₅ and 90 pounds of K₂ O while 4 tons of alfalfa will remove twice this amount, namely 40 pounds of P₂ O₅ and 180 pounds of K₂ O. This table shows the amount of plant food removed by various crops.

Legumes normally get most of their nitrogen from the air.

Table 5. Composition of some of the feeds in percentage.

Feed	Dry Matter	Digestible Protein	TDN
1. Roughages			
Alfalfa hay	90.5	10.9	50.7
Timothy hay	89.0	3.0	49.1
Corn silage	27.6	1.2	18.3
Grass silage	25.6	2.0	15.5
Wheat straw	92.6	0.3	40.6
Kent. bluegrass pasture	30.2	4.1	20.7
Dehydrated alfalfa meal	92.7	12.4	54.4
Alfalfa-brome pasture	72.4	3.6	14.6
2. Concentrates			
(a) Cereals			
Corn, shelled	85.0	6.7	80.1
Barley	89.4	10.0	77.7
Oats	90.2	9.4	70.1
Wheat	89.5	11.1	80.0
(b) Cereal by-products			
Wheat bran	90.1	13.3	66.9
Brewers' dried grains	93.0	22.0	67.1
Corn gluten meal	91.6	36.7	79.7
(c) High protein supplements			
Soybean meal	90.4	42.0	78.1
Linseed meal	91.0	30.7	70.3
Tankage	92.8	50.5	65.8
Fishmeal	92.0	53.6	70.8
Skim milk, dried	93.9	29.8	79.8
(d) Miscellaneous			
Cane molasses	73.4	0	53.7
Beet pulp, dried	91.2	4.1	68.7
Dry matter basis			

Table 6. Daily nutritive requirements of some animals.

Animal	Dry Matter (lbs)	Digestible Protein (lbs)	TDN (lbs)
500 - lb. growing heifer	10.9 - 13.1	0.81 - 0.92	6.8 - 8.2
1,000 - lb. pregnant beef cow	14.2 - 20.0	0.70 - 0.80	7.5 - 10.5
800 - lb. fattening steer	17.8 - 20.4	1.52 - 1.68	14.1 - 15.9
80 - lb. fattening lamb	2.3 - 2.8	.21 - .24	1.8 - 2.1
150 - lb. lactating ewe	4.3 - 5.0	.33 - .36	2.8 - 3.2
500 - lb. pregnant sow	6.0 - 7.4	.76 - .92	4.9 - 6.0
50 - lb. fattening pig	2.6 - 3.2	.37 - .45	2.2 - 2.6

8. Fill in the lbs. of feed needed per lbs. gain in Table 7, below, for all classes of animals.

Table 7. Feed consumption, gain and feed/gain.

Body Weight (lbs.)	Daily Feed Consumption (lbs.)	Average Daily Gain (lbs.)	Lbs. Feed/lb. gain
STEERS			
800 - 900	22.3	2.7	
900 - 1,000	25.8	2.6	
1,000 - 1,100	28.2	2.3	
1,100 - 1,200	31.0	2.1	
HOGS			
175 - 200	5.0	1.52	
200 - 225	5.8	1.60	
225 - 250	6.8	1.70	
250 - 275	7.2	1.64	
LAMBS			
50 - 75	2.2	.40	
75 - 100	2.9	.45	
100 - 125	3.4	.40	
125 - 150	3.8	.35	

ADVANCED EQUATIONS
Level 2

Agriculture

1. A farmer is plowing a rectangular field which is 2,600 feet by 1,250 feet. How wide a uniform strip must be plowed around the edge in order that half of the field will remain to be plowed?
2. A dealer bought a number of sheep for \$27,648.00. After 5 had died, he sold the rest of the sheep at a profit of \$3.00 each, thereby making \$2,417.00 on the whole transaction. How many sheep did he buy originally?
3. A man has 2,000 feet of wire fencing with which to enclose a pasture. One side can use the existing fence. What are the dimensions and the area of the largest rectangular area that can be fenced off?
4. A fruit dealer paid \$1,120. for pears and apples. He sold the pears for \$278.10 and the apples for \$824.50. If his percentage of loss on the apples was the same as his percentage of gain on the pears, the gain and loss being computed on the cost, how much did he pay for each kind of fruit?
5. It is necessary to get a 780 gallon tank in a space 128 inches long. What must the diameter of this tank be to fit in the space?
6. The gate to a pasture needs a right triangular brace. The gate is to be 142 inches wide and $42 \frac{3}{4}$ inches high, how long must the third piece be to complete the construction?

PERIMETER AND AREA
Level 1

Agriculture

1. Mr. Jones has a square field that contains 160 acres, if he makes 10 trips around the field with a combine with a 16 foot header, how many acres have been covered? (Assume a 5 % overlap.)
2. Applying 0.3 lbs/100 sq.ft., how many pounds of a complete fertilizer (Vigoro) would be needed to fertilize a lawn 106 feet by 94 feet assuming the house and walk take up 1,400 sq.ft. of the lot?
3. Calculate the cost to build a 4 rail fence 200 feet long using 4 by 6's, 6 feet long for posts with 10 foot spacing and 2 by 6's for the rails. (2 by 6's cost 28¢ a board foot; 4 by 6's cost 36¢ a board foot)
4. In a calibration test of an 18 x 8 grain drill, 30 turns of the drive wheel yielded 6.4 lbs. of oats when set in notch 38. If the circumference of the wheel is 12.1 feet, how many bushels/acre are being sown when the drill is set in notch 38?
5. Determine the acres plowed per hour when a tractor is operating at 3.8 mph and is pulling ten 16 inch moldboard bottoms at a depth of 5.8 inches. What will be the total draft in pounds pull, if there is a draft of 9 pounds per square inch? How many acres can be plowed in 10 hours when the field efficiency is 78 percent?
6. How many acres can be cultivated in a 10 hour day by a tractor and four row cultivator traveling at 5.3 mph if the field efficiency is 75 percent and rows are spaced 40 inches apart?
7. A cylinder, 16 inches in length and 10 inches in diameter, is completely filled with oil and a pressure of 26 pounds is applied through an opening in the top. What is the total pressure in pounds on the side of the cylinder?

PERIMETER AND AREA
Level 2

Agriculture

8. Determine the number of tomato plants needed to fill 60 rows each 300 ft. long, when the plants are to be spaced $2\frac{1}{2}$ ft. apart.
9. The piston in a hydraulic lift has a diameter of $4\frac{1}{4}$ inches. Find the number of pounds force available from a piston when operating with a pressure of 1,845 lbs/sq.in.
10. At 270 rpm, how far does a point on the circumference of a 8 in. pulley wheel travel in one hour?
11. Allowing 2 inches for rolling at the edges, how many square feet of tin are required to make 270 ft. of gutter whose cross section is a semicircle 3.6 inches in diameter?
12. What is the surface area of a platform 4 feet wide built around a 30 foot tank?

VOLUME
Level 1

Agriculture

1. To provide a base for a concrete floor, a fill of sand averaging $1\frac{1}{4}$ feet deep is to be made in an implement shed that is 80 feet by 24 feet. How many cubic yards of sand will be needed?
2. At 12,400 gallons per minute, how long will it take to apply 2 inches of water to 200 acres?
3. If you have bales 16 inches x 18 inches x 3 feet weighing 95 lbs., how many ton of hay and how large a storage area would you need for 800 head of cattle? (Assume you would feed 40 lbs. of hay per head per day from November 1st to March 20th)
4. Determine the average density in pounds per square foot if a 20 ft. diameter silo 50 ft. high contains 396 ton.
5. Find the weight of a bar of brass $3\frac{3}{4}$ inches in diameter and 8 feet $3\frac{3}{4}$ inches long. Brass weighs about 510 lbs. per cu.ft.
6. A skid tank for use in a farmers truck measures 5 feet in diameter and is 10 feet long. If this is filled to 85 % capacity with a liquid fertilizer that weighs 9.2 pounds per gallon, what is the weight of the contained fertilizer?

Level 2

7. A dipping vat is 10 yards long, 12 feet deep, its width is 10 feet at the bottom and 15 feet at the top (trapezoidal cross section). The ends of the vat are vertical. Dip flows into the vat at a rate of 50 gal/min. Find the time in hours that is required to fill the vat to a depth of 10 feet.

VOLUME
Level 2

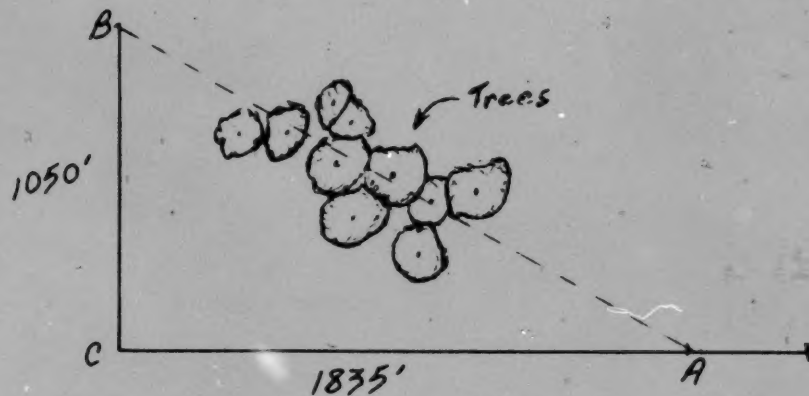
Agriculture

8. A pipe 7.8 inches inside diameter and 13 feet long is laying horizontally. Water is 5 inches deep in the pipe. How many gallons of water are in the pipe?
9. How many gallons of water per second will be discharged by a pipe 8 $\frac{1}{2}$ inches in diameter, if the water has a velocity of 4 $\frac{1}{4}$ ft. per second?
10. A sample bale of hay from a block shaped stack measures 16 by 20 by 20 inches and weighs 90 lbs. To the nearest ton how much hay is there in the stack if it is 100 feet long, 24 feet wide and 21 feet tall?
11. A cylindrical liquid petroleum tank has its ends in the form of hemispheres. The overall length of the tank is 20 feet, the inside diameter is 4 $\frac{3}{4}$ feet. Find the volume in cubic feet.
12. Using an organic phosphate for the control of spiders at the rate of 1 lb/12,000 ft.³, how many pounds will be needed for a glass house that is 80 feet long, 24 feet wide with 8 foot walls and a roof gable 4 feet above the walls?
13. A cylindrical grain storage bin is 15 feet in diameter and 20 feet high. If it is empty, how many minutes will it take to fill the bin if the auger delivers 20 bushels per minute?

RIGHT TRIANGLE TRIGONOMETRY
Level 2

Agriculture

1. How high up the side of a building will a 24 foot extension ladder reach when set at a recommended safety angle of 75° with the ground?
2. Determine how far up a hillside a tank must be located to provide a 80 foot minimum head (vertical height) of water at a valve located at the base of the hill. The average slope of the hill is 27° .
3. It is necessary to run a fence line from point A to point B in the figure below, neither point being visible from the other. At what angle should the fence line be set in relation to line AC?



4. Find the center to center distance between 12 bolt holes drilled on the rim of a 2.5' radius circle.
5. How long a rafter is required for a shed roof whose span is 30 feet if the roof makes an angle of 24° with the horizontal?
6. A guy wire from the top of a pole to a point on the ground 35 feet from the foot of the pole makes an angle of 77° from the horizontal.
(a) How high is the pole? (b) How long must the guy wire be if two feet of wire are needed for tying?

RIGHT TRIANGLE TRIGONOMETRY
Level 2

Agriculture

7. Find the center to center distance between 8 bolt holes drilled equidistant in the rim of a 4 foot circle.
8. How much interest will be due at the end of one year and six months on \$3,600 when the rate of interest is 7 %?

EXPONENTS AND LOGARITHMS
Level 2

Agriculture

1. One method for finding the area of a triangle is to use the formula:

$$A = \sqrt{S(S-a)(S-b)(S-c)}$$

in which S equals one-half the perimeter of the triangle, and a , b , and c are lengths of the three sides. Find the number of area in a triangular field with sides 1,024.6 feet, 2,104.3 feet and 2,359.9 feet.

2. One method for finding the area of a triangle is to use the formula:

$$\text{Area} = 1/2 (\text{side})(\text{side})(\text{sine of included angle})$$

Find the area in acres, of a triangular field having one side that is 1,824 feet long, one that is 834 feet long and the sides form an angle of 52° .

3. How many feet long is the radius of a circle whose area is 10 acres?
4. Find the number of acres in a triangular field with sides: 512.4 feet, 602.4 feet and 600.0 feet.
5. At 5,255 gallons per minute, how many acre feet of water can be pumped in 24 hours?
6. Determine the volume in gallons of storage for a spherical tank 20.3 feet in diameter.
7. If you apply 5,875 gallons per minute, how many hours will it take to apply 1 inch of water to 154.8 acres?

EXPONENTS AND LOGARITHMS
Level 2

Agriculture

8. A formula for the velocity (feet per second) of water in a drain tile is given as:

$$V = 138 R^{2/3} S^{1/4}$$

where S is the slope and R depends upon the size of the tile and the depth of the water running in it. For a 6 inch tile running about full, $R = 0.135$. Under these conditions, what would be the velocity of the water in a tile line whose slope is 0.15 %?

9. The soil on your farm has an infiltration rate $I = 3.5 T^{-.64}$ where I is the instantaneous rate in inches per hour and T is the time in minutes since irrigation began. Using logarithms determine the following information: (a) The infiltration rate two hours after irrigation began. (b) The time when the rate will have dropped to 0.3 in/hr., which is the rate at which runoff from the sprinkler will begin.
10. How many ton of wheat are there in a conical pile measuring 80 ft. high and having a base diameter of 68.5 feet? (Assuming a weight of 48 lbs./ft.³.)
11. The foot of a 24 foot ladder is 8 feet from the wall of a building against which its top rests. How high does the ladder reach on the wall?

GLOSSARY

Agriculture

BOARD FOOT - A square foot of lumber one inch or less in thickness.

BOTTOM - The plow shear measured on the cutting edge. (example: 16 inches when hooked in tandem called 5 - 16 inch bottoms)

BROODED - To set on and hatch, such as eggs.

CYANAMID - A white crystalline compound prepared by the reaction of carbon dioxide and hot sodium amide and by other reactions.

DEPRECIATION - An allowance for exhaustion, obsolescence or wear and tear of property.

DIGESTIBLE PROTEIN - That portion of a nutrient that can be digested and taken into the body.

DRAIN TILE - Concrete or pottery pipe for water outlets from the soil.

EDGE DROP CELLS - Holes on a corn planter which allow a certain distance between the grains placed in the ground.

FORAGE FRAME - A metal square or circle enclosing one square yard, used to take clippings of the various grasses (range management). A rectangular metal frame enclosing one square yard used for counting plants in germination tests.

FORCE - A physical power or strength exerted against a person or thing.

FUMIGENT - A compound or chemical that is active as a pesticide in the gaseous state.

GERMINATION PERCENT - The comparison of those plants which have sprouted to those planted. (Example: if 80 seeds have sprouted out of 100 planted the germination percent is 80 %)

G.V.W. - Gross vehicle weight. The weight of the empty vehicle plus its load.

GLOSSARY

Agriculture

GUY WIRE - A wire attached to an upright object to stabilize it.

HEAT OF FUSION - The amount of heat needed to change a substance from solid to liquid. Also the heat given off when a substance is changed from liquid to solid.

INFILTRATION RATE - How fast water moves downward into the soil.

LIVESTOCK RATION - A selection of feed stuffs that provide a nutritionally balanced diet.

MOLDBOARD PLOW - Used for turning under and covering crop residues. The shear does the cutting, the moldboard folds the soil over.

MURIATE OF POTASH - A salt of hydrochloric acid oxide, prepared from ash and used as a fertilizer.

ORGANIC PHOSPHATE CHEMICAL - Insecticides that affect the central nervous system. (examples: Parathion, or Guthion)

P.T.O. - Power take off is the rotating shaft to the back of the tractor used to run machines such as a baler.

SEED DRILL - Planting equipment for grain; a large box mounted on wheels pulled by a tractor. Common terminology, 18 x 8 grain drill, 18 seed tubes or furrow openers with a distance of 8 inches between each tube.

SPECIFIC GRAVITY - The ratio of the weight of a substance to the weight of an equal volume of water.

T.D.N. - Total digestible nutrient.

TANKAGE - Slaughterhouse waste from which the fat has been rendered, used as fertilizer or feed.

THERMAL EFFICIENCY - The ability of a substance to resist the passage of heat.

THERMS - A great calorie or 1,000 small calories.

Appendix

MEASUREMENT CONVERSIONS

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Acre-feet	Gallons	325,900
Acres	Square chains (Gunter's)	10
Acres	Rods	160
Acres	Square links (Gunter's)	100,000
Acres	Hectares or square hectometers	.4047
Acres	Square feet	43,560
Acres	Square meters	4,047
Acres	Square yards	4,840
Ampere-hours	Coulombs	3,600
Ampere-hours	Faradays	0.03731
Angstrom units	Microns or (mu)	.0001
Barrels (U.S.,dry)	cubic inches	7056
Barrels (U.S.,dry)	Quarts (dry)	105
Barrels (U.S., liquid)	Gallons	31.5
Btu. (Brit. thermal units)	Gram-calories	252
Btu.	Horsepower-hours	.000391
Btu.	Joules	1,054.8
Btu.	Kilogram-calories	0.2520
Btu.	Kilogram-meters	107.5
Btu.	Kilowatt-hours	.0002298
Bushels	Cubic feet	1.2445
Bushels	Cubic inches	2,150.4
Bushels	Cubic meters	0.03524
Bushels	Liters	35.24
Bushels	Pecks	4
Bushels	Pints (dry)	64
Bushels	Quarts (dry)	32
Calories, gram (mean)	Btu. (mean)	.003969
Centigrade	Fahrenheit	$(C^{\circ} \times 9/5) + 32$

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Centigrams	Grams	0.01
Centiliters	Cubic inches	.6103
Centiliters	Fluid ounces (U.S.)	.3382
Centimeters	Feet	.03281
Centimeters	Inches	0.3937
Centimeters	Kilometers	.00001
Centimeters	Meters	0.01
Centimeters	Miles	.0000062
Centimeters	Millimeters	10
Centimeters	Yards	.01094
Centimeters/second	Feet/minute	1.1969
Centimeters/second	Feet/second	0.03281
Centimeters/second	Kilometers/hour	0.036
Centimeters/second	Meters/minute	0.6
Centimeters/second	Miles/hour	0.02237
Centimeters/second	Miles/minute	.0003728
Chains	Inches	792
Chains	Meters	20.12
Chains (surveyor's or Gunter's)	Yards	22
Circumference	Radians	6.283
Cords	Cord feet	8
Cubic centimeters	Cubic Feet	.000035
Cubic centimeters	Cubic inches	.06102
Cubic centimeters	Cubic meters	.000001
Cubic centimeters	Cubic yards	.0000013
Cubic centimeters	Gallons (U.S., liquid)	.000264
Cubic centimeters	Liters	0.001
Cubic centimeters	Pints (U.S., liquid)	.002113
Cubic feet	Bushels (dry)	0.8036
Cubic Feet	Cubic centimeters	28,320
Cubic feet	Cubic inches	1,728
Cubic feet	Cubic meters	0.02832
Cubic feet	Cubic yards	0.03704
Cubic feet	Gallons (U.S., liquid)	7.48052
Cubic feet	Liters	28.32
Cubic feet	Pints (U.S., liquid)	59.84
Cubic Feet	Quarts (U.S., liquid)	29.92
Cubic feet/minute	Cubic centimeters/second	472
Cubic feet/minute	Gallons/second	0.1247
Cubic feet/minute	Liters/second	0.4720
Cubic feet/minute	Pounds of water/ minute	62.43
Cubic feet/second	Million gallons/day	0.646317
Cubic feet/second	Gallons/minute	448.831
Cubic inches	Cubic centimeters	16.39
Cubic inches	Cubic feet	.000579
Cubic inches	Cubic meters	.0000164
Cubic inches	Gallons	.004329
Cubic inches	Liters	0.01639

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Cubic inches	Mil-feet	106100
Cubic inches	Pints (U.S., liquid)	0.03463
Cubic inches	Quarts (U.S., liquid)	0.01732
Cubic meters	Bushels (dry)	28.38
Cubic meters	Cubic centimeters	1,000,000
Cubic meters	Cubic feet	35.31
Cubic meters	Cubic inches	61,023
Cubic meters	Cubic yards	1,308
Cubic meters	Gallons (U.S., liquid)	264.2
Cubic meters	Liters	1,000
Cubic meters	Pints (U.S., liquid)	2,113
Cubic meters	Quarts (U.S., liquid)	1,057
Cubic yards	Cubic centimeters	764,600,000
Cubic yards	Cubic feet	27
Cubic yards	Cubic inches	46,656
Cubic yards	Cubic meters	0.7646
Cubic yards	Gallons (U.S., liquid)	202
Cubic yards	Liters	764.6
Cubic yards	Pints (U.S., Liquid)	1,615.9
Cubic yards	Quarts (U.S., liquid)	807.9
Degrees (angle)	Radians	0.01745
Degrees/second	Radians/second	0.01745
Degrees/second'	Revolutions/minute	0.1667
Degrees/second	Revolutions/second	.002778
Drams (apothecaries' or troy)	ounces (avoirdupois)	0.1371429
Drams	Grams	1.7718
Feet	Centimeters	30.48
Feet	Kilometers	.0003048
Feet	Meters	0.3048
Feet	Miles (naut.)	.0001645
Feet	Miles (stat.)	.0001894
Feet	Millimeters	304.8
Feet	Mils	12,000
Feet/minute	Feet/second	0.01667
Feet/minute	Kilometers/hour	0.01829
Feet/minute	Meters/minute	0.3048
Feet/minute	Miles/hour	0.01136
Feet/second	Centimeters/second	30.48
Feet/second	Kilometers/hour	1.097
Feet/second	Knots	0.5921
Feet/second	Meters/minute	18.29
Feet/second	Miles/hour	0.6818
Feet/ second	Miles/minute	0.01136
Foot-pounds	Btu.	.001286
Foot-pounds	Ergs	13,560,00
Foot-pounds	Gram-calories	0.3238
Foot-pounds	Horsepower-hours	.000000505
Furlongs	Feet	660

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Furlongs	Miles (U.S.)	0.125
Furlongs	Rods	40
Gallons	Cubic centimeters	3,785
Gallons	Cubic feet	0.1337
Gallons	Cubic inches	231
Gallons	Cubic meters	.003785
Gallons	Cubic yards	.00495
Gallons	Liters	3.785
Gallons (Liq. Br. Imp.)	Gallons (U.S., liquid)	1.20095
Gallons (U.S.)	Gallons (Imp.)	0.83267
Gallons of water	Pounds of water	8.3453
Gallons/minute	Cubic feet/hour	8.0208
Gallons/minute	Cubic feet/ second	.002228
Gallons/minute	Liters/second	0.06308
Grams	Dynes	980.7
Grams	Grains	15.43
Grams	Joules/meter (newtons)	.0098
Grams	Kilograms	0.001
Grams	Milligrams	1,000
Grams	Ounces (avdp.)	0.03527
Grams	Ounces (troy)	0.03215
Grams	Poundals	0.07093
Grams	Pounds	.002205
Hands	Centimeters	10.16
Hectares	Acres	2.471
Hectares	Square feet	107,600
Hogsheads (U.S.)	Cubic feet	8.42184
Hogsheads (U.S.)	Gallons (U.S.)	63
Horsepower	Btu./minute	42.44
Horsepower	Foot-pounds/minute	33,000
Horsepower	Foot-pounds/second	550
Horsepower	Kilogram-calories/minute	10.68
Horsepower	Kilowatts	0.7457
Horsepower	Watts	745.7
Horsepower 550 ft.-lbs./sec.)	Horsepower (metric) (542.5 ft.-lbs./sec.)	1.014
Horsepower (metric) (542.5 ft.-lbs./sec.)	Horsepower (550 ft.-lbs. sec.)	0.9863
Hundredweights (long)	Pounds	112
Hundredweights (long)	Tons	0.05
Hundredweights (short)	Ounces (avdp.)	1600
Hundredweights (short)	Pounds	100
Hundredweights (short)	Tons (long)	0.0446429

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Hundredweights (short)	Tons (metric)	0.0453592
Inches	Centimeters	2.540
Inches	Meters	.0254
Inches	Miles	.00001578
Inches	Millimeters	25.40
Inches	Mils	1,000
Inches	Yards	.02778
Kilograms	Dynes	980,665
Kilograms	Grams	1,000
Kilograms	Pounds	2.205
Kilograms/meter	Pounds/foot	0.6720
Kilograms	Quintals	.01
Kilograms	Tons (long)	.000984
Kilograms	Tons (short)	.001102
Kilograms/square centimeter	Dynes	980,665
Kilometer	Inches	39,370
Kilometer	Meters	1,000
Kilometer	Miles	0.6214
Kilometer	Millimeters	1,000,000
Kilometer	Yards	1,094
Kilometer/hour	Feet/minute	54.68
Kilometer/hour	Feet/second	0.9113
Knots	Nautical miles/hour	1
Knots	Statute miles/hour	1.151
Leagues	Miles (approximate)	3
Light years	Kilometers	9,460,910,000,000
Light Years	Miles	5,900,000,000,000
Links (engineer's)	Inches	12
Links (surveyors)	Inches	7.92
Liters	Bushels (U.S., dry)	0.02838
Liters	Cubic centimeters	1,000
Liters	Cubic feet	0.03531
Liters	Cubic inches	61.02
Liters	Cubic meters	0.001
Liters	Cubic yards	.00131
Liters	Gallons (U.S., liquid)	0.2642
Liters	Pints (U.S., liquid)	2.113
Liters	Quarts (U.S., liquid)	1.057
Liters/minute	Cubic feet/second	.000589
Liters/minute	Gallons/second	.0044
Meters	Centimeters	100
Meters	Feet	3.281
Meters	Inches	39.37
Meters	Kilometers	0.001
Meters	Miles (nautical)	.0005396
Meters	Miles (statute)	.0006214
Meters	Millimeters	1,000

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Meters	Varas	1.179
Meters	Yards	1.094
Meters/minute	Centimeters/second	1.667
Meters/minute	Feet/minute	3.281
Meters/minute	Feet/second	0.05468
Meters/minute	Kilometers/hour	0.06
Meters/minute	Knots	0.03238
Meters/minute	Miles/hour	0.03728
Meters/second	Feet/minute	196.8
Meters/second	Feet/second	3.281
Meters/second	Kilometers/hour	3.6
Meters/second	Kilometers/minute	0.06
Meters/second	Miles/hour	2.237
Meters/second	Miles/minute	0.03728
Microns	Meters	.000001
Miles/hour	Centimeters/second	44.70
Miles/hour	Feet/minute	88
Miles/hour	Feet/second	1.467
Miles/hour	Kilometers/hour	1.609
Miles/hour	Kilometers/minute	0.02682
Miles/hour	Knots	0.8684
Miles/hour	Meters/minute	26.82
Miles/hour	Miles/minute	0.1667
Miles/minute	Kilometers/minute	1.609
Miles/minute	Knots/minute	0.8684
Miles/minute	Miles/hour	60
Miles (nautical)	Feet	6,080.27
Miles (nautical)	Kilometers	1.853
Miles (nautical)	Meters	1,853
Miles (nautical)	Miles (statute)	1.1516
Miles (nautical)	Yards	2,027
Miles (statute)	Centimeters	160,900
Miles (statute)	Feet	5,280
Miles (statute)	inches	63,360
Miles (statute)	Kilometers	1.609
Miles (statute)	Meters	1,609
Miles (statute)	Miles (nautical)	0.8684
Miles (statute)	Yards	1,760
Millimeters	Centimeters	0.1
Millimeters	Feet	.003281
Millimeters	inches	0.03937
Millimeters	Kilometers	.000001
Millimeters	Meters	0.001
Millimeters	Miles	.0000006214
Millimeters	Mils	39.37
Millimeters	Yards	.001094
Mils	Inches	0.001
Ounces	Drams	16
Ounces	Grains	437.6

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Ounces	Grams	28.349527
Ounces	Ounces (troy)	0.9115
Ounces	Pounds	0.0625
Ounces	Tons (long)	.0000279
Ounces	Tons (metric)	.00002835
Ounces (fluid)	Cubic inches	1.805
Ounces (fluid)	Liters	0.02957
Pecks (British)	Cubic inches	554.6
Pecks (British)	Liters	9.091901
Pecks (U.S.)	Bushels	0.25
Pecks (U.S.)	Cubic inches	537.605
Pecks (U.S.)	Liters	8.809582
Pecks (U.S.)	Quarts (dry)	8
Pints (dry)	Cubic inches	33.60
Pints (liquid)	Cubic centimeters	473.2
Pints (liquid)	Cubic feet	0.01671
Pints (liquid)	Cubic inches	28.87
Pints (liquid)	Cubic meters	.0004732
Pints (liquid)	Cubic yards	.0006189
Pints (liquid)	Gallons	0.125
Pints (liquid)	Liters	0.4732
Pints (liquid)	Quarts (liquid)	0.5
Pounds	Dynes	444,823
Pounds	Grains	7,000
Pounds	Grams	453.5924
Pounds	Joules/centimeter	0.04448
Pounds	Joules/meter (newtons)	4.448
Pounds	Kilograms	0.4536
Pounds	Ounces	16
Pounds	Ounces (troy)	14.5833
Quarts (dry)	Cubic inches	67.20
Quarts (liquid)	Cubic centimeters	946.4
Quarts (liquid)	Cubic feet	0.03342
Quarts (liquid)	Cubic inches	57.75
Quarts (liquid)	Cubic meters	.0009464
Quarts (liquid)	Cubic yards	.001238
Quarts (liquid)	Gallons	0.25
Quarts (liquid)	Liters	0.9463
Quintals	Kilometers	100
Radians	Degrees	57.30
Radians	Minutes	3,438
Revolutions	Degrees	360
Revolutions	Radians	6.283
Revolutions/minute	Degrees/second	6
Revolutions/minute	Radians/second	0.1047
Revolutions/minute	Revolutions/second	0.01667
Rods	Chains (Gunter's)	.25
Rods	Feet	16.5
Rods	Meters	5.029

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
Rods (surveyor's measure	Yards	5.5
Square centimeters	Square foot	.001076
Square centimeters	Square inches	0.1550
Square centimeters	Square meters	0.0001
Square centimeters	Square yards	.0001196
Square feet	Acres	.00002296
Square feet	Square centimeters	929
Square feet	Square inches	144
Square feet	Square meters	0.09290
Square feet	Square miles	.00000003587
Square feet	Square millimeters	92,900
Square feet	Square yards	0.1111
Square inches	Circular mulls	1,273,000
Square inches	Square centimeters	6.452
Square inches	Square feet	.006944
Square inches	Square millimeters	645.2
Square inches	Square mils	1,000,000
Square inches	Square yards	.0007716
Square kilometers	Acres	247.1
Square kilometers	Square centimeters	10,000,000,000
Square kilometers	Square feet	10,760,000
Square kilometers	Square inches	1,550,000,000
Square kilometers	Square meters	1,000,000
Square kilometers	Square miles	0.3861
Square kilometers	Square yards	1,196,000
Square meters	Acres	.0002471
Square meters	Square centimeters	10,000
Square meters	Square feet	10.76
Square meters	Square inches	1550
Square meters	Square miles	.000000386
Square meters	Square millimeters	1,000,000
Square meters	Square yards	1.196
Square miles	Acres	640
Square miles	Square feet	27,880,000
Square miles	Square Kilometers	2.590
Square miles	Square meters	2,590,000
Square miles	Square yards	3,098,000
Square millimeters	Circular mils	1,973
Square millimeters	Square centimeters	0.01
Square yards	Square acres	.0002066
Square yards	Square centimeter	8,361
Square yards	Square feet	9
Square yards	Square inches	1,296
Square yards	Square meters	0.8361
Temperature (°C.) + 273	Absolute temperature (°C.) 1	

<u>To convert</u>	<u>Into</u>	<u>Multiply by</u>
Temperature °(C.) + 17.78	Temperature (°F.)	1.8
Temperature (°F.) + 460	Absolute temperature (°F.)	1
Temperature (°F.) - 32	Temperature (°C.)	5/9
Tons (long)	Kilograms	1,016
Tons (long)	Pounds	2,240
Tons (long)	Tons (short)	1.120
Tons (metric)	Kilograms	1,000
Tons metric	Pounds	2,205
Tons (short)	Kilograms	907.1848
Tons (short)	Ounces	32,000
Tons (short)	Ounces (troy)	29,166.66
Tons (short)	Pounds	2,000
Yards	Centimeters	91.44
Yards	Kilometers	.0009144
Yards	Meters	0.9144
Yards	Miles (nautical)	.0004934
Yards	Miles (statute)	.0005682
Yards	Millimeters	914.4

AGRICULTURE SOLUTIONS

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WHOLE NUMBERS
Solutions

Agriculture

1. $(\$475/\text{acre})(2,750 \text{ acres}) = \$1,306,250$
2. Income: $\$63,409. + \$21,564. + \$3,674. + \$1,800. + \$5,102. + \$150. = \$95,699.$
Expenses: $\$31,340. + \$5,864. + \$10,103. + \$8,115. + \$7,000. + \$534. + \$2,856. + \$9,304. + \$2,100. = \$77,216.$
Profit: $\$95,699. - \$77,216. = \$18,483.$
3. (a) $878 \text{ lbs.} + 907 \text{ lbs.} + 838 \text{ lbs.} + 1,010 \text{ lbs.} + 1,113 \text{ lbs.} + 930 \text{ lbs.} = 5,676 \text{ lbs.}$
 $5,676/6 = 946 \text{ lbs.}$
(b) $3,072 \text{ lbs.}/32 \text{ days} = 96 \text{ lb/day}, (96 \text{ lbs/day}) / 6 \text{ steers} = 16 \text{ lbs/steer/day}$
(c) $576 \text{ lbs.}/32 \text{ days} = 18 \text{ lbs./day}, (18 \text{ lbs./day}) / (6 \text{ steers/day}) = 3 \text{ lbs./steer}$
4. $(3 \text{ tractors})(15 \text{ gallons/tractor/day}) = 45 \text{ gallons/day}$
 $(540 \text{ gallons}) / (45 \text{ gallons/day}) = 12 \text{ days}$
5.
$$\frac{(124 \text{ bales})(5 \text{ bales})(10 \text{ bales})(80 \text{ lbs.})}{2,000 \text{ lbs./ton}} = 248 \text{ tons}$$
6. $\$1,450.00/(\$12.00/\text{ball}) = 120 \text{ balls with } \$10.00 \text{ left over}$
7. $(124 \text{ fr.})(8 \text{ fr.})(29\text{¢}/\text{sq.ft.}) = 28768\text{¢} \text{ or } \$287.68$
8. Vol. = (length)(width)(height) = $(30 \text{ feet})(8 \text{ feet})(5 \text{ feet}) = 1200 \text{ cu.ft.}$
Weight = $(1200 \text{ cu.ft.})(48 \text{ lbs./cu.ft.})(\text{cwt}/100 \text{ lbs.}) = 576 \text{ cwt}$

WHOLE NUMBERS
Solutions

Agriculture

9. (a) $9,600 \text{ lbs.} / (32 \text{ days})(100 \text{ steers}) = 3 \text{ lbs./day/steer}$
(b) $67,200 \text{ lbs.} / (32 \text{ days})(100 \text{ steers}) = 21 \text{ lbs./day/steer}$
(c) $(6\text{¢})(21) = 126\text{¢}$ or $\$1.26$
(d) $\$1.26/3 = \$.42 = 42\text{¢}$
(e) $(21 \text{ lbs./day/steer}) / (3 \text{ lbs./day/steer}) = 7 \text{ to } 1$
10.
$$\frac{\$20,500 - \$2,500}{10} = \frac{18,000}{10} = \$1,800.$$
11. $\text{Cost} = \$18,700. + (14,000)(\$2.00) + (14,000)(\$1.00)$
 $\text{Cost} = \$18,700. + \$28,000. + \$14,000.$
 $\text{Cost} = \$60,700.$
12. $(231 \text{ cubic inches/gallon})(55 \text{ gallon}) = 12,705 \text{ cubic inches}$
13. $126 \text{ acres} / 9 \text{ acres} = 14 \text{ times as many}$
 $(14)(1 \text{ man}) = 14 \text{ men}$
 $(14)(2 \text{ horses}) = 28 \text{ horses}$
14. $(8 \text{ ft.})(12 \text{ in./ft.}) = 96 \text{ inches}$
 $(10 \text{ ft.})(12 \text{ in./ft.}) = 120 \text{ inches}$
 $(96 \text{ in.})(120 \text{ in.}) / (10 \text{ sq.in./chick}) = 1,152 \text{ chicks}$

AG Sol-2.

WHOLE NUMBERS
Solutions

Agriculture

15. 1 bushel oats = 32 lbs.
1 bushel bran = 20 lbs.
 $5,000 \text{ lbs.} - (4,000 \text{ lbs.} + 10 (20 \text{ lbs.}))$
 $= 5,000 \text{ lbs.} - (4,000 \text{ lbs.} + 200 \text{ lbs.})$
 $= 5,000 \text{ lbs.} - (4,200 \text{ lbs.}) = 800 \text{ lbs.}$
 $800 \text{ lbs.} / (32 \text{ lbs./bushel}) = 25 \text{ bushel}$

FRACTIONS
Solutions

Agriculture

1. $(18)(2 \text{ in.})(8 \text{ in.})(16 \text{ ft.}) / 12 = 384 \text{ board feet}$

2. Total weight = $27 \frac{1}{4} \text{ lbs.} + 19 \frac{1}{2} \text{ lbs.} + 8 \text{ lbs.} + 34 \frac{3}{4} \text{ lbs.}$
 $+ 27 \frac{1}{4} \text{ lbs.} + 19 \frac{2}{4} \text{ lbs.} + 8 \text{ lbs.} + 34 \frac{3}{4} \text{ lbs.} = 88 \frac{6}{4} \text{ lbs.}$
 $= 89 \frac{1}{2} \text{ lbs.}$

$$\frac{89 \frac{1}{2} \text{ lbs.}}{53 \frac{1}{3} \text{ lbs./roll}} = \frac{179/2 \text{ rolls}}{160/3} = 537/320 \text{ rolls}$$

$$(537/320 \text{ rolls})(150 \text{ ft./roll}) = 251 \frac{23}{32} \text{ ft., approx. } 250 \text{ ft.}$$

3. $(653 \frac{1}{3} \text{ ft.})(3 \frac{1}{3} \text{ ft.}) = (1960/3 \text{ ft.})(10/3 \text{ ft.}) = 19600/9 \text{ sq.ft.}$
 $(19600/9 \text{ sq.ft.})(1 \text{ acre}/43,560 \text{ sq.ft.}) = 1/20 \text{ acre}$

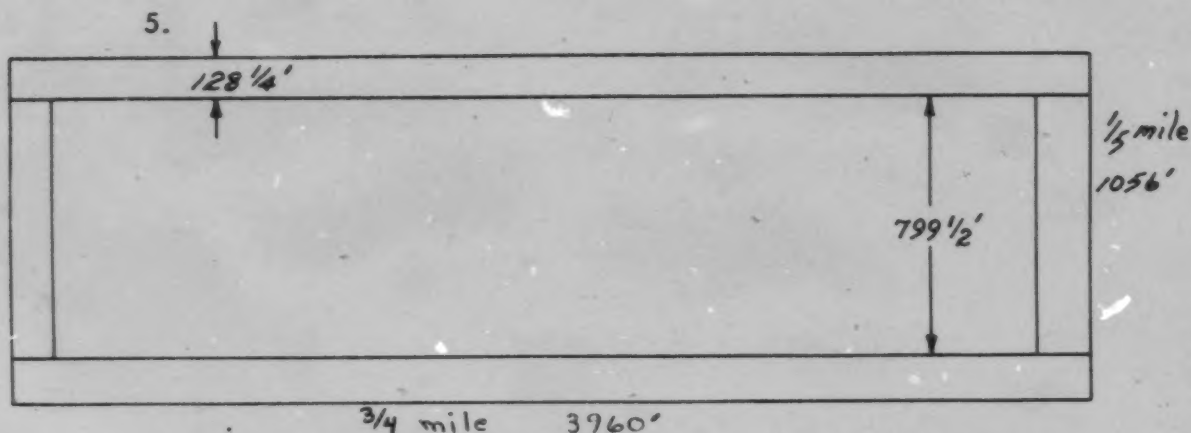
4. Cows = $1214 + 714 = 1,928$

Calves = 1214

$$(1,928 \text{ cows})(21 \frac{1}{2} \text{ lbs./cow}) + (1,214 \text{ calves})(3/7)(21 \frac{1}{2} \text{ lbs./calf})$$
$$= (1,928)(43/2 \text{ lbs.}) + (1,214)(3/7)(43/2 \text{ lbs.}) = 41,452 \text{ lbs.} + 11,186 \frac{1}{7} \text{ lbs.} = 52,638 \frac{1}{7} \text{ lbs.}$$

Convert to tons

$$(52,638 \frac{1}{7} \text{ lbs.})(1 \text{ ton}/2,000 \text{ lbs.})(\$12 \frac{2}{3} \text{ per ton}) = \$333.37$$



$$(25 \frac{3}{4} \text{ ft.})(5) = (103 \frac{3}{4} \text{ ft.})(5) = 513 \frac{3}{4} \text{ ft.} = 128 \frac{1}{4} \text{ ft.}$$

$$1056 \text{ ft.} - 2(128 \frac{1}{4} \text{ ft.}) = 1056 \text{ ft.} - 256 \frac{1}{2} \text{ ft.} = 799 \frac{1}{2} \text{ ft.}$$

$$\text{Acre} = 2(3960 \text{ ft.})(128 \frac{1}{4} \text{ ft.}) + 2(799 \frac{1}{2} \text{ ft.})(128 \frac{1}{4} \text{ ft.})$$

$$= (2)(3960 \text{ ft.})(513 \frac{3}{4} \text{ ft.}) + (2)(1599 \frac{1}{2} \text{ ft.})(513 \frac{3}{4} \text{ ft.})$$

$$= 1,015,740 \text{ sq.ft.} + 205,071 \frac{3}{4} \text{ sq.ft.}$$

$$= (1,220,819 \frac{3}{4} \text{ sq.ft.})(1 \text{ acre}/43,560 \text{ sq.ft.})$$

$$= 28 \text{ acres}$$

6. Mash: $(35 \text{ lbs./hen})(\$7.80/100 - \text{lbs.}) = \$2.73 \text{ per hen}$

Grain: $(50 \text{ lbs./hen})(\$6.00/100 - \text{lbs.}) = \$3.00 \text{ per hen}$

Total feed = $(\$2.73/\text{hen} + \$3.00/\text{hen})(10,000 \text{ hens})$

$$= (\$5.73/\text{hen})(10,000 \text{ hens})$$

$$= \$57,300.$$

Labor = $(1/3)(\$57,300) = \$19,100.00$

FRACTIONS
Solutions

Agriculture

$$7. \text{ Rind} = (1/7)(24 \frac{1}{2} \text{ lbs.}) = (1/7)(49 \text{ lbs.}/2) = 3 \frac{1}{2} \text{ lbs.}$$

$$\text{Weight of bacon} = 24 \frac{1}{2} - 3 \frac{1}{2} = 21 \text{ lbs.}$$

$$\text{Cost of strip} = (24 \frac{1}{2})(0.56) = (49/2)(0.56) = \$13.72$$

$$\text{Selling price} = (21)(0.98) = \$20.58$$

$$\text{Profit} \quad \$20.58 - \$13.72 = \$6.86$$

$$8. \quad (1 \text{ mile})(5,280 \text{ ft.}/1 \text{ mile})(4 \frac{1}{8} \text{ ft.}) = (5,280 \text{ ft.})(33 \text{ ft.}/8) \\ = (21,780 \text{ sq-ft.})(1 \text{ acre}/43,560 \text{ sq-ft.}) = 1/2 \text{ acre}$$

$$9. \quad \frac{(10)(1 \text{ in.})(8 \text{ in.})(12 \text{ ft.})}{12} = 80 \text{ board ft.}$$

$$\frac{(24)(2 \text{ in.})(4 \text{ in.})(16 \text{ ft.})}{12} = 256 \text{ board ft.}$$

$$\frac{(8)(2 \text{ in.})(8 \text{ in.})(12 \text{ ft.})}{12} = 128 \text{ board ft.}$$

$$\frac{(2)(4 \text{ in.})(6 \text{ in.})(8 \text{ ft.})}{12} = \frac{32 \text{ board ft.}}{\text{Total } 496 \text{ board ft.}}$$

$$10. \quad (13 \frac{1}{4} \text{ kw-hr})(3 \frac{3}{8} \text{¢/kw-hr}) = (53/4)(27/8 \text{¢}) \\ = 1431/32 \text{¢} \\ = 44 \frac{23}{32} \text{¢} \\ = \$0.45$$

FRACTIONS
Solutions

Agriculture

11. Sum of years = $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$

Annual Depreciation	Remaining Balance
$(10/55)(\$20,500 - \$2,500) = \$3,272.73$	\$17,227.27
$(9/55)(\$20,500 - \$2,500) = \$2,945.46$	\$14,281.81
$(8/55)(\$20,500 - \$2,500) = \$2,618.19$	\$11,663.62
$(7/55)(\$20,500 - \$2,500) = \$2,290.91$	\$9,372.71
$(6/55)(\$20,500 - \$2,500) = \$1,963.64$	\$7,409.07
$(5/55)(\$20,500 - \$2,500) = \$1,636.37$	\$5,772.70
$(4/55)(\$20,500 - \$2,500) = \$1,309.09$	\$4,463.61
$(3/55)(\$20,500 - \$2,500) = \$981.82$	\$3,481.79
$(2/55)(\$20,500 - \$2,500) = \$654.55$	\$2,827.24
$(1/55)(\$20,500 - \$2,500) = \$327.24$	\$2,500.00

12. $(1/2)(\$2.89/\text{hundred lbs.}) = (\$1.445/\text{hundred lbs.})(16 \text{ hundred lbs.})$
 $= \$23.12$

13. 1 acre = 43,560 sq.ft.

$$(43,560 \text{ sq.ft./acre})(1/4000 \text{ acre}) = 10 \frac{3560}{4000} \text{ sq.ft.}$$

$$= 10 \frac{89}{100} \text{ sq.ft.}$$

$$\frac{10 \frac{89}{100} \text{ sq.ft.}}{3 \text{ ft.}} = \frac{1089/100 \text{ ft.}}{3} = 1089/300 \text{ ft.} = 3 \frac{63}{100} \text{ ft.}$$

DECIMALS
Solutions

Agriculture

1. $684 \text{ lbs.} / 1120 \text{ lbs.} = 0.61$
2. Total width of plow = $(5)(16 \text{ in.}) = (80 \text{ in.})(1 \text{ ft.} / 12 \text{ in.}) = 6.67 \text{ feet}$
 $(6.67 \text{ ft.})(5,280 \text{ ft.} / \text{mile})(6 \text{ miles} / \text{hour})(10 \text{ hours})(1 \text{ acre} / 43,560 \text{ sq. ft.})$
 $= (48.5 \text{ acres})(0.95) = 46.1 \text{ acres}$
3. $14,386 \text{ lbs.} / 34.2 \text{ acre} = 420.65 \text{ lbs.} / \text{acre}$
4. Volume: $(20.2 \text{ ft.})(6.9 \text{ ft.})(4.3 \text{ ft.}) = 599.3 \text{ cubic feet}$
 $(599.3 \text{ cubic ft.})(0.8036 \text{ bu} / 1 \text{ cubic ft.}) = 481.6 \text{ bu.}$
 $(481.6 \text{ bu.})(60 \text{ lbs.} / \text{bu.}) = 28,897 \text{ lbs.}$
5. $(20 \text{ gallons} / \text{acre})(0.24 \text{ acres} / \text{min.})(60 \text{ min.} / \text{hour}) = 288 \text{ gallons} / \text{hour}$
6. Cottonseed meal: $(2,000)(0.425) = 850 \text{ lbs.}$
Phosphoric acid: $(2,000)(0.45) = 900 \text{ lbs.}$
Kainit: $2,000 - (850 + 900) = 2,000 - 1,750 = 250 \text{ lbs.}$
7. $478.3 \text{ feet} + 597.6 \text{ feet} + 392.1 \text{ feet} + 801.9 \text{ feet}$
 $= (2269.9 \text{ feet})(1 \text{ rod} / 16.5 \text{ ft.}) = (137.6 \text{ rods})(\$1.435 / \text{rod}) = \$197.41$
 $478.3 / 16 = 29.9 = 30 \text{ posts}$
 $597.6 / 16 = 37.4 = 37 \text{ posts as one corner post from above}$
 $392.1 / 16 = 24.5 = 24 \text{ posts as one corner post from above}$
 $801.9 / 16 = 50.1 = 50 \text{ posts as one corner post from above}$
Total T4T posts

8. Calves:

$$\begin{aligned}
 &(\$38.32/100 \text{ lbs.}) (754 \text{ lbs.}) + (197 \text{ days})(2.19 \text{ lbs./day}) - \\
 &(2.19 \text{ lbs./day})(197 \text{ days})(\$27.14/100 \text{ lbs.}) + (\$40.00/100 \text{ lbs.}) \\
 &(754 \text{ lbs.}) = (\$38.32/100 \text{ lbs.})(754 \text{ lbs.} + 431.43 \text{ lbs.}) - (\$117.09 + \\
 &\$301.60) = (\$38.32/100 \text{ lbs.})(1185.43 \text{ lbs.}) - (\$418.69) = \$454.26 \\
 &- \$418.69 = \$35.57 \text{ profit}
 \end{aligned}$$

Yearlings:

$$\begin{aligned}
 &(\$38.08/100 \text{ lbs.}) (843 \text{ lbs.} + (174 \text{ days})(2.26 \text{ lbs./day}) - \\
 &(2.26 \text{ lbs./day})(174 \text{ day})(\$28.96/100 \text{ lbs.}) + (\$38.38/100 \text{ lbs.}) \\
 &(843 \text{ lbs.}) = (\$38.08/100 \text{ lbs.})(843 \text{ lbs.} + 393.24 \text{ lbs.}) - (\$113.89 + \\
 &\$323.55) = (\$38.08/100 \text{ lbs.})(1236.24 \text{ lbs.}) - (437.44) \\
 &= \$470.76 - \$437.43 = \$33.33 \text{ profit.}
 \end{aligned}$$

2 Year Olds:

$$\begin{aligned}
 &(\$38.14/100 \text{ lbs.}) (985 \text{ lbs.} + (162 \text{ days})(2.40 \text{ lbs./day}) - (2.40 \text{ lbs./} \\
 &\text{day})(162 \text{ days})(\$29.14/100 \text{ lbs.}) + (\$38.50/100 \text{ lbs.})(985 \text{ lbs.}) \\
 &= (\$38.14/100 \text{ lbs.})(1373.80 \text{ lbs.}) - (\$492.53) \\
 &= \$523.97 - \$492.52 = \$31.45 \text{ profit}
 \end{aligned}$$

9. Power = Work/Time = (force)(distance)/Time

$$\begin{aligned}
 &= (4.2 \text{ acre-foot/day})(325,900 \text{ gal/acre-foot})(8.35 \text{ lbs/gal})(175 \text{ feet}) \\
 &(1 \text{ day}/24 \text{ hour})(1 \text{ hour}/60 \text{ min.})(1 \text{ hp}/(33,000 \text{ ft.lbs./min.})) = 42.1 \text{ hp}
 \end{aligned}$$

10. Volume: (8 ft.)(14 ft.)(6 ft.) = 672 cubic ft.

$$\begin{aligned}
 &\text{Weight of wheat: } (672 \text{ cu.ft.})(0.8036 \text{ bu/1 cu.ft.})(60 \text{ lbs./1 bu}) \\
 &= 32,401.2 \text{ or } 32,400 \text{ lbs.}
 \end{aligned}$$

Continued on page 10

DECIMALS
Solutions

Agriculture

10. Continued.

Weight of 1 cu.ft. plywood: $(62.4 \text{ lbs./cu.ft.})(0.78) = 48.7 \text{ lbs/cu.ft.}$

1 piece of plywood: $(4 \text{ ft.})(8 \text{ ft.})(1 \text{ in.})(1 \text{ ft}/12 \text{ in.}) = (2.67 \text{ cu.ft./piece})(48.7 \text{ lbs./cu.ft.})(2.67 \text{ cu.ft./piece}) = 130 \text{ lbs./piece}$

$32,400 \text{ lbs.}(130 \text{ lbs./piece}) = 249 \text{ pieces}$

11. $(\$9.00/\text{hundred})(0.35 \text{ hundred}) = \$3.15$

$(\$7.86/\text{hundred})(0.50 \text{ hundred}) = \$3.93$

$\$3.15 + \$3.93 = \$7.08$

$\$7.08 (\$0.68/\text{dozen}) \times (1 \text{ dozen}/12 \text{ eggs}) = \$7.08 \$0.68/12 \text{ eggs}$

$= (\$7.08)(12 \text{ eggs}/\$0.68) = 124.9 \text{ or } 125 \text{ eggs}$

12. $(635 \text{ lbs.})(\$7.23/100 \text{ lbs.}) = \$45.91$

$(275 \text{ lbs.})(\$7.23/100 \text{ lbs.}) + (35 \text{ lbs.})(\$13.00/100 \text{ lbs.}) + (20 \text{ lbs.})$

$(\$9.00/100 \text{ lbs.}) = \$19.88 + \$4.55 + \$1.80 = \$26.23$

Combination is most economical.

$\$45.91 - \$26.23 = \$19.68$ (saved per hundred pounds of live weight gain)

13. $(325 \text{ lbs.})(\$0.065/\text{lbs.}) = \$21.125$

$(275 \text{ lbs.})(\$0.096/\text{lbs.}) = \$26.40$

$(100 \text{ lbs.})(\$0.092/\text{lbs.}) = \$9.20$

$(80 \text{ lbs.})(\$0.175/\text{lbs.}) = \$14.00$

$(70 \text{ lbs.})(\$0.123/\text{lbs.}) = \$8.61$

$(50 \text{ lbs.})(\$0.078/\text{lbs.}) = \$3.90$

$(40 \text{ lbs.})(\$0.082/\text{lbs.}) = \$3.28$

$(34 \text{ lbs.})(\$0.053/\text{lbs.}) = \$1.802$

Continued on page 11

13. Continued.

$$\begin{aligned}
 (15 \text{ lbs.})(\$0.020/\text{lbs.}) &= \$.30 \\
 (10 \text{ lbs.})(\$0.010/\text{lbs.}) &= \$.10 \\
 (1 \text{ pt.})(1 \text{ gal}/8 \text{ pt.})(\$7.30) &= \$.9125 \\
 &\underline{\$89.6295 \text{ per } 1,000 \text{ pounds}}
 \end{aligned}$$

Ready-mixed:

$$\begin{aligned}
 (\$11.25/100 \text{ lbs.})(2,000 \text{ lbs./ton}) &= \$225.00/\text{ton} \\
 (\$89.6295/1,000 \text{ lbs.})(2,000 \text{ lbs./ton}) &= \$179.26/\text{ton} \\
 \text{savings} &= \$45.74/\text{ton}
 \end{aligned}$$

14. Tractor 1

$$\begin{aligned}
 (a) \quad 61.25 \text{ HP}/6.704 \text{ gal. per hr.} &= 9.136 \text{ HP-hr/gal} \\
 (b) \quad (1 \text{ gal}/9.136 \text{ HP-hr})(6.15 \text{ lbs./gal}) &= 0.673 \text{ lb/HP-hr} \\
 (c) \quad (6.704 \text{ gal/hr})(\$0.438/\text{gal}) &= \$2.94/\text{hour} \\
 (d) \quad (\text{output/input})(100\%) &= \frac{(61.25 \text{ HP})(42.44 \text{ BTU/min/HP})(60 \text{ min/hr})}{(6.704 \text{ gal/hr})(124,300 \text{ BTU/gal})} \\
 (100\%) &= (155,967 / 833,307)(100\%) = 18.72\%
 \end{aligned}$$

Tractor 2

$$\begin{aligned}
 (a) \quad 61.73 \text{ HP}/8.615 \text{ gal. per hr.} &= 7.165 \text{ HP-hr/gal} \\
 (b) \quad (1 \text{ gal}/7.165 \text{ HP-hr})(7.061 \text{ lbs./gal}) &= 0.985 \text{ lb/HP-hr} \\
 (c) \quad (8.615 \text{ gal/hr})(\$0.326/\text{gal}) &= \$2.81/\text{hour} \\
 (d) \quad (\text{output/input})(100\%) &= \frac{(61.73 \text{ HP})(42.44 \text{ BTU/min/HP})(60 \text{ min/hr})}{(8.615 \text{ gal/hr})(138,380 \text{ BTU/gal})} \\
 (100\%) &= (157,189 / 1,192,144)(100\%) = 13.19\%
 \end{aligned}$$

Continued on page 12

DECIMALS
Solutions

Agriculture

14. Continued.

Tractor 3

$$(a) 61.92 \text{ HP}/5.109 \text{ gal. per hr.} = 12.120 \text{ HP-hr/gal}$$

$$(b) (1 \text{ gal}/12,120 \text{ HP-hr})(4.25 \text{ lbs/gal}) = 0.351 \text{ lb/HP-hr}$$

$$(c) (5.109 \text{ gal/hr})(\$0.365/\text{gal}) = \$1.86/\text{hour}$$

$$(d) (\text{output}/\text{input})(100\%) = \frac{(61.92 \text{ HP})(42.44 \text{ Btu/min/HP})(60 \text{ min/hr})}{(5,109 \text{ gal/hr})(92,300 \text{ Btu/gal})}$$

$$(100\%)(157,673 / 471,560)(100\%) = 33.44\%$$

$$15. (5 \text{ strands})(3,000 \text{ ft/strand}) / 16.5 \text{ ft/rod} = 9,090 \text{ rods}$$

$$9,090 \text{ rods}/(80 \text{ rods/spool}) = 11.4 \text{ spools or 12 spools needed}$$

$$(12 \text{ spools})(\$11.75/\text{spool}) = \$141.00$$

PERCENTAGE
Solutions

Agriculture

1. 30 % of _____ = 85 lbs.

(0.30) (_____) = 85 lbs.

_____ = 85 lbs./0.30 = 283 lbs.

2. Igran: 50 % of 8 lbs. = (0.50)(8 lbs.) = 4 lbs.

Water: (100 ~~gals~~)(8.35 lbs/~~gal~~) = 835 lbs.

Total: 835 lbs. + 8 lbs. = 843 lbs.

4 lbs is what % of 843 lbs.

4 = (_____ %)(843)

(4 ~~lbs~~/843 ~~lbs.~~)(100) = 0.4745%

3. Total Nitrate needed: (40 ~~acre~~)(80 lbs/~~acre~~) = 3,200 lbs.

Total Phosphate needed: (70 lbs/~~acre~~)(40 ~~acre~~) = 2,800 lbs.

Total Potash needed: (40 lbs/~~acre~~)(40 ~~acre~~) = 1,600 lbs.

(a) 33.5 % of what number = 3,200 lbs.

(0.335)(_____) = 3,200 lbs.

_____ = 3,200 lbs/0.335 = 9,552 lbs. or 4.8 tons

(b) 0-20-20 is 20 % P_2O_5 and 20 % K_2O therefore using the smaller amount (K_2O) in this case 20 % of what number = 1,600 lbs.

(0.20) (_____) = 1,600 lbs.

_____ = 1,600 lbs/0.20 = 8,000 lbs. or 4 ton

for 8,000 lbs. K_2O and 8,000 lbs. P_2O_5 thus needed (2,800 - 1,600) = 1,200 lbs. P_2O_5 more. 20 % of what = 1,200 lbs.

(0.20)(_____) = 1,200 lbs.

_____ = 1,200 lbs/0.20 = 6,000 lbs. or 3 ton

Needed: 4.8 ton of 33.5 %N, 4 ton of 0-20-20, 3 ton of 0-20-0

PERCENTAGE
Solutions

Agriculture

4. 8 % of what number = 2.1 lbs.
(0.08)() = 2.1 lbs.
 = 2.1 lbs/0.08 = 26.25 lbs.
5. 234 is what percent of 257
234 = % of 257
(234/257)(100) = % = 91.05 %
6. Total N needed: (275 ~~acres~~)(60 lbs/acre) = 16,500 lbs.
53.5 % of = 16,500 lbs.
(0.535)() = 16,500 lbs.
 = 16,500 lbs/0.535 = 30,841
7. (a) Barley: 78.9 % of 100 lbs. = 78.9 lbs. T.D.N.
\$4.97/78.9 lbs. = \$0.0630/lb.
Corn: 82.7 % of 100 lbs. = 82.7 lbs. T.D.N.
\$5.12/82.7 lbs. = \$0.0619/lb.
(b) \$0.0630 - \$0.0619 = \$0.0011/lb. or 0.11¢/lb. (corn cheaper)
8. Amt. pure Toxaphene: (100 ~~gallons~~)(8.35 lbs./~~gallons~~)(0.25 %)
(100 ~~gals~~)(8.35 lbs/~~gal~~)(0.0025) = 2.0875 lbs.
Amt. 59 % BHC: 59 % of what = 2.0875 lbs.
(0.59)() = 2.0875 lbs.
 = 2.0875 lbs./0.59 = 3.54 lbs.

PERCENTAGE
Solutions

Agriculture

$$9. \quad \$20,000. - (0.25)(\$20,000.) = \$20,000. - \$5,000. = \$15,000.$$

$$\$15,000. - (0.05)(\$15,000.) = \$15,000. - \$750. = \$14,250.$$

or

$$(\$20,000.)(0.75)(0.95) = \$14,250.$$

$$10. \quad (a) \quad (250 \text{ steers})(980 \text{ lbs./steer})(\$0.48/\text{lb.}) = \$117,600.$$

(b) Selling price - 3 % of selling price

$$\$117,600. - (0.03)(\$117,600.) = \$117,600. - \$3,528. = \$114,072.$$

or another method:

$$100 \% - 3 \% = 97 \% \quad (0.97)(\$117,600.) = \$114,072.$$

$$(c) \quad (250 \text{ steers})(980 \text{ lbs./steer})(0.60)(\$0.89/\text{lb.}) = \$130,830.$$

$$11. \quad (a) \quad \text{Needed N: } (140 \text{ acres})(90 \text{ lbs./acres}) = 12,600 \text{ lbs.}$$

$$P_2 O_5 : (140 \text{ acres})(100 \text{ lbs./acres}) = 14,000 \text{ lbs.}$$

$$K_2 O : (140 \text{ acres})(40 \text{ lbs./acres}) = 5,600 \text{ lbs.}$$

20 ton = 40,000 lbs. of 10-10-10 which contains 10 % (40,000 lbs.)
= 0.10 (40,000 lbs.) = 4,000 lbs. of each

$$\text{Still needed N: } 12,600 \text{ lbs.} - 4,000 \text{ lbs.} = 8,600 \text{ lbs.}$$

$$P_2 O_5 : 14,000 \text{ lbs.} - 4,000 \text{ lbs.} = 10,000 \text{ lbs.}$$

$$K_2 O : 5,600 \text{ lbs.} - 4,000 \text{ lbs.} = 1,600 \text{ lbs.}$$

$$\text{For Nitrate use: } 32-0-0 \quad 32 \% \text{ of } \underline{\hspace{2cm}} = 8,600 \text{ lbs.}$$

$$(0.32)(\underline{\hspace{2cm}}) = 8,600 \text{ lbs.}$$

$$(\underline{\hspace{2cm}}) = 8,600 \text{ lbs.} / 0.32$$

$$= 26,875 \text{ lbs. or } 13.5 \text{ ton.}$$

$$\text{For } K_2 O \text{ start with: } 0-30-20$$

$$20 \% \text{ of } \underline{\hspace{2cm}} = 1,600 \text{ lbs.}$$

$$(0.20) (\underline{\hspace{2cm}}) = 1,600 \text{ lbs.}$$

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PERCENTAGE
Solutions

Agriculture

11. Continued.

$$(\text{ }) = 1,600 \text{ lbs.}/0.20$$

= 8,000 lbs. or 4 ton

Gives 1,600 K_2O and 2,400 lbs. P_2O_5 .

Still needed: P_2O_5 10,000 - 2,400 = 7,600 lbs.

$$20\% \text{ of } \text{ } = 7,600 \text{ lbs.}$$

$$(0.20)(\text{ }) = 7,600 \text{ lbs.}$$

$$(\text{ }) = 7,600 \text{ lbs.}/0.20$$

= 38,000 lbs. or 19 ton

Thus needed: 13.5 ton 32-0-0

20. ton 10-10-10

4. ton 0-30-20

19. ton 0-20-0

Total

56.5 ton

$$(b) (56.5 \text{ ton}/140 \text{ acres})(2,000 \text{ lbs.}/\text{ton}) = 807 \text{ lbs.}/\text{acre}$$

$$(c) 10-10-10 (20 \text{ ton}/140 \text{ acres})(2,000 \text{ lbs.}/\text{ton}) = 286 \text{ lbs.}/\text{acre}$$

$$32-0-0 (13.5 \text{ ton}/140 \text{ acres})(2,000 \text{ lbs.}/\text{ton}) = 193 \text{ lbs.}/\text{acre}$$

$$0-30-20 (4 \text{ ton}/140 \text{ acres})(2,000 \text{ lbs.}/\text{ton}) = 57 \text{ lbs.}/\text{acre}$$

$$0-20-0 (19 \text{ ton}/140 \text{ acres})(2,000 \text{ lbs.}/\text{ton}) = 271 \text{ lbs.}/\text{acre}$$

$$12. (10,870 \text{ lbs.}/\text{acre})(100\% - 32.5\%) / (100\% - 15.5\%) (56 \text{ lbs.}/\text{bu}) \\ = (10,870 \text{ lbs.}/\text{acre})(67.5\%/84.5\%)(1 \text{ bu}/56 \text{ lbs.}) = 155.1 \text{ bu}/\text{acre}$$

$$13. 7\% \text{ of what number} = 8 \frac{3}{4} \text{ ft.}$$

$$(0.07)(\text{ }) = 8 \frac{3}{4} \text{ ft.}$$

$$\text{ } = 8 \frac{3}{4} \text{ ft.}/0.07 = 125 \text{ ft.}$$

PERCENTAGE
Solutions

Agriculture

14. Total feed: $3 \frac{3}{4}$ lbs. + $2 \frac{1}{4}$ lbs. = 6 lbs.

$3 \frac{3}{4}$ is _____ % of 6

$3 \frac{3}{4}$ = _____ % of 6

$(3 \frac{3}{4})(100)/6$ = _____ % = 62.5 %

15. $(2,000 \text{ lbs.})(14 \%) = (2,000 \text{ lbs.})(0.14) = 280 \text{ lbs. moisture}$

$2,000 \text{ lbs.} - 280 \text{ lbs.} = 1,720 \text{ lbs. dry material}$

59 % of what number = 1,720 lbs.

$(0.59)(\text{_____}) = 1,720 \text{ lbs.}$

_____ = $1,720 \text{ lbs.}/0.59 = 2,915 \text{ lbs.}$

$$\frac{\$73.}{(2,915 \text{ lbs.})(1 \text{ ton}/2,000 \text{ lbs.})} = \frac{\$73.}{1.458 \text{ ton}} = \$50.07/\text{ton}$$

RATIO AND PROPORTION
Solutions

Agriculture

$$1. \quad \frac{1.56}{1} = \frac{W}{62.4 \text{ lbs./cu.ft.}}$$

$$(1.56)(62.4 \text{ lbs./cu.ft.}) = (W)(1)$$

$$97.3 \text{ lbs./cu.ft.} = W$$

$$2. \quad (1 \text{ gal.})(8 \text{ pt./1 gal.}) = 8 \text{ pt.}$$

$$(3 \text{ qt.})(2 \text{ pt./1 qt.}) = 6 \text{ pt.}$$

$$\begin{array}{r} 1 \text{ pt.} = 1 \text{ pt.} \\ \hline \text{Total} \quad 15 \text{ pt.} \end{array}$$

$$15 \text{ pt.}/0.4 \text{ A} = R/1 \text{ A}$$

$$(15 \text{ pt.})(1 \text{ A}) = R (0.4 \text{ A})$$

$$15 \text{ pt.} (1 \text{ A})/0.4 \text{ A} = R = (37.5 \text{ pt.})(1 \text{ gal.}/8 \text{ pt.}) = 4 \frac{11}{16} \text{ gal.}$$

$$3. \quad \text{Area: } (80 \text{ ft.})(75 \text{ ft.}) = 6,000 \text{ sq.ft.}$$

$$560 \text{ lbs./acre} = 560 \text{ lbs.}/43,560 \text{ sq.ft.} = A/6,000 \text{ sq.ft.}$$

$$(560 \text{ lbs.})(6,000 \text{ sq.ft.}) = (43,560 \text{ sq.ft.})(A)$$

$$(560 \text{ lbs.})(6,000 \text{ sq.ft.}) / 43,560 \text{ sq.ft.} = A = 77.1 \text{ lbs.}$$

$$4. \quad \text{Total gain:}$$

$$(540 \text{ lbs./head})(250 \text{ head}) = 135,000 \text{ lbs.}$$

$$6.8 \text{ lbs./1 lb.} = N/135,000 \text{ lbs.}$$

$$(135,000 \text{ lbs.})(6.8 \text{ lbs.}) / 1 \text{ lb.} = N = (918,000 \text{ lbs.}) (1 \text{ ton}/2,000 \text{ lbs.})$$

$$= 459 \text{ ton.}$$

$$5. \quad \text{Cement:}$$

$$\frac{1 \frac{1}{2} \text{ cu. ft.}}{8 \text{ cu. ft.}} = \frac{A}{125 \text{ cu.ft.}}$$

$$(125 \text{ cu.ft.})(3/2 \text{ cu.ft.}) = (8 \text{ cu.ft.})(A)$$

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RATIO AND PROPORTION
Solutions

Agriculture

5. Continued.

$$\frac{(125 \text{ cu.ft.})(3/2 \text{ cu.ft.})}{8 \text{ cu.ft.}} = A = 23 \frac{7}{16} \text{ cu.ft.} \quad 23 \frac{1}{2} \text{ cu.ft.}$$

Sand:

$$\frac{2 \frac{3}{4} \text{ cu.ft.}}{8 \text{ cu.ft.}} = \frac{A}{125 \text{ cu.ft.}}$$

$$(125 \text{ cu.ft.})(2 \frac{3}{4} \text{ cu.ft.}) = (8 \text{ cu.ft.})(A)$$

$$\frac{(125 \text{ cu.ft.})(11/4 \text{ cu.ft.})}{8 \text{ cu.ft.}} = A = 42 \frac{31}{32} \quad 43 \text{ cu.ft.}$$

Gravel:

$$\frac{6 \frac{1}{4} \text{ cu.ft.}}{8 \text{ cu.ft.}} = \frac{A}{125 \text{ cu.ft.}}$$

$$(125 \text{ cu.ft.})(6 \frac{1}{4} \text{ cu.ft.}) = (8 \text{ cu.ft.})(A)$$

$$\frac{(125 \text{ cu.ft.})(25/4 \text{ cu.ft.})}{8 \text{ cu.ft.}} = A = 97 \frac{21}{32} \approx 97 \frac{1}{2} \text{ cu.ft.}$$

6. 5 in./8 in. = N/1,600 rpm

$$(5 \text{ in.})(1,600 \text{ rpm}) = (8 \text{ in.})(N)$$

$$\frac{(5 \text{ in.})(1,600 \text{ rpm})}{8 \text{ in.}} = N = 1,000 \text{ rpm}$$

$$7. \quad V = \pi(d^2/4)h \quad \frac{1,000 \text{ gal.}}{\pi d^2 h/4} = \frac{A}{\pi(2D)^2 h/4}$$

$$1,000 \text{ gal.} = \pi D^2 h/4$$

$$(1,000 \text{ gal.}) \frac{(\pi)(4D^2)h}{4} = A (\pi D^2 h/4)$$

$$\frac{(1,000 \text{ gal.})(\pi)(4D^2)(h)/4}{\pi D^2 h/4} = A$$

$$4,000 \text{ gals.} = A$$

RATIO AND PROPORTION
Solutions

Agriculture

$$8. \quad R_1 / R_2 = N_2 / N_1 \quad R_1 / 1,800 \text{ rpm} = 24 \text{ teeth} / 16 \text{ teeth}$$

$$(16 \text{ teeth})(R_1) = (24 \text{ teeth})(1,800 \text{ rpm})$$

$$R_1 = (24 \text{ teeth})(1,800 \text{ rpm}) / 16 \text{ teeth} = 2,700 \text{ rpm}$$

$$9. \quad N / (120 \text{ rev./min.}) = 18 \text{ tooth} / (24 \text{ rev./min.})$$

$$(24 \text{ rev./min.})(N) = (18 \text{ tooth})(120 \text{ rev./min.})$$

$$N = (18 \text{ teeth})(120 \text{ rev./min.}) / (24 \text{ rev./min.}) = 90 \text{ teeth}$$

$$10. \quad (1/2) / 1 = N / 16 \quad 8 \text{ seeds} / 80 \text{ inches} = 1 \text{ seed} / D$$

$$N (1) = 16 \text{ seeds} (1/2) \quad 8 \text{ seeds} (D) = (1 \text{ seed})(80 \text{ inches})$$

$$N = 8 \text{ seeds} \quad (D) = \frac{(1 \text{ seed})(80 \text{ inches})}{8 \text{ seeds}}$$

$$(D) = 10 \text{ inches}$$

$$11. \quad R_L / R_S = d_S / d_L$$

$$270 \text{ rpm} / R_S = 5 \text{ in.} / 18 \text{ in.}$$

$$(270 \text{ rpm})(18 \text{ in.}) / 5 \text{ in.} = R_S$$

$$(270 \text{ rpm})(18 \text{ in.}) / 5 \text{ in.} = R_S = 972 \text{ rpm}$$

$$12. \quad \text{Cottonseed meal:}$$

$$2.1 \text{ lbs.} / N = 2.4 \text{ lbs.} / 1,000 \text{ lbs.}$$

$$(2.1 \text{ lbs.})(1,000 \text{ lbs.}) = N (2.4 \text{ lbs.})$$

$$(2.1 \text{ lbs.})(1,000 \text{ lbs.}) / (2.4 \text{ lbs.}) = N = 875 \text{ lbs.}$$

Corn:

$$8 \text{ lbs.} / N = 2.4 \text{ lbs.} / 1,000 \text{ lbs.}$$

$$(8 \text{ lbs.})(1,000 \text{ lbs.}) = (2.4 \text{ lbs.}) N$$

$$(8 \text{ lbs.})(1,000 \text{ lbs.}) / (2.4 \text{ lbs.}) = N = 3333 \text{ lbs.}$$

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RATIO AND PROPORTION
Solutions

Agriculture

12. Continued.

Prairie Hay:

$$12 \text{ lbs.} / N = 2.4 \text{ lbs.} / 1,000 \text{ lbs.}$$

$$(12 \text{ lbs.})(1,000 \text{ lbs.}) = (2.4 \text{ lbs.})(N)$$

$$(12 \text{ lbs.})(1,000 \text{ lbs.}) / 2.4 \text{ lbs.} = N = 5,000 \text{ lbs.}$$

TRADE FORMULAS
Solutions

Agriculture

1. $C = 2 \pi r = 2(3.1416)(2.7) = 16.96 \text{ ft.}$
 $100 \text{ ft.}/(16.96 \text{ ft./turn}) = (100 \text{ ft.})(1 \text{ turn}/16.96 \text{ ft.}) = 5.9 \text{ turns}$
2. Area per plant: $(22 \text{ inches})(10 \text{ inches}) = 220 \text{ sq.in.}$
 $(1 \text{ acre}/43,560 \text{ sq.ft.})(1 \text{ sq.ft.}/144 \text{ sq.in.})$
 $= (43,560 \text{ sq.ft./acre})(144 \text{ sq.in.}/1 \text{ sq.ft.})(1 \text{ plant}/220 \text{ sq.in.})$
 $= 28,512 \text{ plants/acre}$
3. Volume = (length)(width)(thickness)
 $= (60 \text{ ft.})(28 \text{ ft.})(3 \text{ inches})(1 \text{ ft.}/12 \text{ inches}) = 420 \text{ cu.ft.}$
 $(420 \text{ cu.ft.})(\$8.00/\text{cu.ft.})(1.03) = \$3,460.80$
4. (a) $A = \pi r^2 = 3.1416 (1,500 \text{ ft.})^2 (1 \text{ acre}/43,560 \text{ sq.ft.})$
 $= 162 \text{ acres}$
 $1 \text{ acre ft.} = 325,900 \text{ gals.}$
(b) $(162 \text{ acres})(3 \text{ in.})(1 \text{ ft.}/12 \text{ in.})(325,900 \text{ gal./acre-ft.})$
 $= 13,198,950 \text{ gals.}$
5. Volume = $\pi d^2 h/4 = (3.1414)[(5 \text{ ft.})^2/4](10 \text{ ft.}) = 196.35 \text{ cu.ft.}$
 $(196.35 \text{ cu.ft.})(1,728 \text{ cu.in.}/1 \text{ cu.ft.})(1 \text{ gal.}/231 \text{ cu.in.})(9.2 \text{ lbs./gal.})$
 $(0.85) = 5.74 \text{ tons}$

6.



$$L = \sqrt{(12 \text{ ft.})^2 + (5 \text{ ft.})^2} = \sqrt{144 \text{ sq. ft.} + 25 \text{ sq. ft.}}$$

$$= \sqrt{169 \text{ sq. ft.}} = 13 \text{ ft.}$$

$$\text{Total length } (13 \text{ ft.}) + (1 \text{ ft.}) = 14 \text{ ft.}$$

$$\text{Area} = (2)(14 \text{ ft.})(60 \text{ ft.}) = 1,680 \text{ sq. ft.}$$

$$7. \quad 1 \text{ acre foot} = (1 \text{ acre})(1 \text{ ft.})(43,560 \text{ sq. ft./acre}) = 43,560 \text{ cu. ft.}$$

$$(43,560 \text{ cu. ft.})(65 \text{ pounds/cu. ft.}) = 2,831,400 \text{ lbs.}$$

$$(2,831,400 \text{ lbs.})(21 \text{ parts/1,000,000 parts}) = 59.5 \text{ pounds}$$

$$8. \quad \text{Volume} = [(24 \text{ ft.})(8 \text{ ft.}) + 1/2 (24 \text{ ft.})(6 \text{ ft.})] (80 \text{ ft.})$$

$$= (192 \text{ sq. ft.} + 73 \text{ sq. ft.})(80 \text{ ft.})$$

$$= (264 \text{ sq. ft.})(80 \text{ ft.}) = 21,120 \text{ cu. ft.}$$

$$21,120 \text{ cu. ft. (bomb/5,250 cu. ft.)} = 4 \text{ bombs}$$

$$9. \quad \text{Volume} = 1/2 (15 \text{ } 1/4 \text{ inches})(7 \text{ } 3/4 \text{ inches})(12 \text{ ft.})(12 \text{ in./1 ft.})$$

$$= 8,509 \text{ } 1/2 \text{ cu. in.}$$

$$(8,509 \text{ } 1/2 \text{ cu. in.})(1 \text{ gal./231 cu. in.}) = 37 \text{ gallons}$$

$$10. \quad \text{Volume} = (\text{length})(\text{width})(\text{thickness})$$

$$= (80 \text{ ft.})(100 \text{ ft.})(0.4 \text{ in./hour})(1 \text{ ft./12 in.})$$

$$= 267 \text{ cu. ft./hour}$$

Continued on page 24

TRADE FORMULAS
Solutions

Agriculture

10. Continued.

$$(267 \text{ cu.ft./hour})(1,728 \text{ cu.in./1 cu.ft.})(1 \text{ gal./231 cu.in.}) \\ = 1,997 \text{ gallons/hour} \approx 2,000 \text{ gallons/hour}$$

$$11. \text{ Volume} = \left[(\text{base \# 1}) + (\text{base \# 2}) \right] / 2 (\text{height})(\text{length}) \\ = (12 \text{ ft.} + 2 \text{ ft.}) / 2 (8 \text{ ft.})(20 \text{ ft.}) = (14 / 2 \text{ ft.})(8 \text{ ft.})(20 \text{ ft.}) \\ = (1,120 \text{ cu.ft.})(0.8036 \text{ bu./cu.ft.})(60 \text{ lbs./bu.}(\text{ton}/2,000 \text{ lbs.})) \\ = 27 \text{ ton}$$

$$12. \text{ Volume} = \pi(d^2/4)h = (3.1416) \left[(12 \text{ ft.})^2 / 4 \right] (20 \text{ ft.}) \\ = 2,262 \text{ cu.ft.} \\ (2,262 \text{ cu.ft.})(0.8036 \text{ bu./1 cu.ft.})(1 \text{ min.}/13 \text{ bu.}) = 140 \text{ min.} \\ = 2 \text{ hours, } 20 \text{ min.}$$

$$13. \text{ Surface Area} = (\pi)(\text{radius})(\text{slant height}) \\ = \pi r \sqrt{h^2 + r^2} \\ = (3.1416)(11 \text{ ft.}) \sqrt{(14 \text{ ft.})^2 + (11 \text{ ft.})^2} \\ = (3.1416)(11 \text{ ft.}) \sqrt{196 \text{ sq.ft.} + 121 \text{ sq. ft.}} \\ = (3.1416)(11 \text{ ft.}) \sqrt{317 \text{ sq.ft.}} \\ = (3.1416)(11 \text{ ft.}) (17.8 \text{ ft.}) \\ = 615.12 \text{ sq.ft.} \\ \text{Cost} = (615.12 \text{ sq.ft.})(1 \text{ sq.yd.}/9 \text{ ft.}^2)(\$4.00/\text{sq.yd.}) = \$273.38$$

SIMPLE EQUATIONS
Solutions

Agriculture

1. Let x = number of pounds of 35 % superphosphate
 $8\% (2,000 \text{ lbs.}) + 35\% (x) = 18\% (2,000 \text{ lbs.} + x)$
 $0.08 (2,000 \text{ lbs.}) + 0.35 x = 0.18 (2,000 \text{ lbs.} + x)$
 $160 \text{ lbs.} + 0.35 x = 360 \text{ lbs.} + 0.18 x$
 $0.17 x = 200 \text{ lbs.}$
 $x = 200 \text{ lbs.} / 0.17 = 1176.5 \text{ lbs.}$
2. Let x = number of quarts that must be removed, and the number of quarts of pure antifreeze to be added.
 $15\% (24 \text{ qt.}) - 15\% (x) + 100\% (x) = 50\% (24 \text{ qt.})$
 $0.15 (24 \text{ qt.}) - 0.15 (x) + 1.00 (x) = 0.50 (24 \text{ qt.})$
 $3.6 \text{ qt.} - 0.15 x + x = 12 \text{ qt.}$
 $0.85 x = 8.4 \text{ qt.}$
 $x = 9.88 \text{ qt. approx.}$
3. Let x = number of lbs. of 7 % feed
 $100 \text{ lbs.} - x$ = number of lbs. of 17 % feed
 $7\% (x) + 17\% (100 \text{ lbs.} - x) = 14\% (100 \text{ lbs.})$
 $0.07 x + 0.17 (100 \text{ lbs.} - x) = 14\% (100 \text{ lbs.})$
 $0.07 x + 17 \text{ lbs.} - 0.17 x = 14 \text{ lbs.}$
 $- 0.10 x = - 3 \text{ lbs.}$
 $x = - 3 \text{ lbs.} / - 0.10 = 30 \text{ lbs.}$
 $(100 \text{ lbs.} - x) = (100 \text{ lbs.} - 30 \text{ lbs.}) = 70 \text{ lbs.}$
Thus 30 lbs. of 7 % digestible protein and 70 lbs. of 17 % digestible protein.
4. Consider data for one ton or 2,000 lbs. of fertilizer.
Let x = the number of pounds of potash in 2,000 lbs. of fertilizer.
Continued on page 26

SIMPLE EQUATIONS
Solutions

Agriculture

4. Continued.

Then $x/0.40$ = the number of lbs. of muriate of potash to furnish the x lbs. potash.

Let $2x$ = the number of pounds of nitrogen in 2,000 lbs. of fertilizer.

Then $2x/0.32$ = the number of pounds of cyanamid required to furnish $2x$ lbs. of nitrogen.

Let $3x$ = the number of pounds of superphosphate required to furnish $3x$ lbs. of phosphoric acid.

Thus $2x/0.32 + 3x/0.35 + x/0.40 = 2,000$ lbs.

$$(1120) \quad \frac{200x}{32} + \frac{300x}{35} + \frac{100x}{40} = (2,000 \text{ lbs.})(1120)$$

$$7,000x + 9,600x + 2,800x = 2,240,000 \text{ lbs.}$$

$$19,400x = 2,240,000 \text{ lbs.}$$

$$x = 115.46 \text{ lbs. approx.}$$

x must be a whole number therefore 115 lbs.

Then 230 lbs. Nitrogen, 345 lbs. phosphoric acid and 115 lbs. potash.

5. Let x = number of lbs. of 5 % digestible protein.

100 lbs. - x = number of lbs. of 19 % digestible protein.

$$5\% (x) + 19\% (100 \text{ lbs.} - x) = 13\% (100 \text{ lbs.})$$

$$0.05x + 0.19(100 \text{ lbs.} - x) = 0.13(100 \text{ lbs.})$$

$$0.05x + 19 \text{ lbs.} - 0.19x = 13 \text{ lbs.}$$

$$-0.14x = -6 \text{ lbs.}$$

$$x = -6 \text{ lbs.} / -0.14 = 42.9 \text{ lbs.}$$

$$(100 \text{ lbs.} - x) = 100 \text{ lbs.} - 42.9 \text{ lbs.} = 57.1 \text{ lbs.}$$

Thus 42.9 lbs. of 5 % digestible protein and 57.1 lbs. of 19 % digestible protein.

SIMPLE EQUATIONS
Solutions

Agriculture

6. Let x = number of lbs. of 42 % butterfat
 $42 \% (x) + 3.5 \% (2,000 \text{ lbs.}) = 12 \% (2,000 \text{ lbs.} + x)$
 $0.42 x + 0.035 (2,000 \text{ lbs.}) = 0.12 (2,000 \text{ lbs.} + x)$
 $0.42 x + 70 \text{ lbs.} = 240 \text{ lbs.} + 0.12 x$
 $0.30 x = 170 \text{ lbs.}$
 $x = 170 \text{ lbs.} / 0.30 = 567 \text{ lbs. of 42 \% butterfat cream}$
7. Let x = number of bushels of corn
 $(\$3.94/\text{bushel})(x) = (\$0.38/\text{pound})(100 \text{ lbs.})$
 $\$3.94 x/\text{bushel} = \$38.00$
8. $x = \$38.00 / (\$3.94/\text{bushel}) = 9.6 \text{ bushels of corn}$
Let x = number of lbs. of 64 % moisture hay
 $100 \% - 64 \% = 36 \% \text{ dry matter}$
 $100 \% - 9 \% = 91 \% \text{ dry matter}$
 $36 \% (x) = 91 \% (2,000 \text{ lbs.})$
 $0.36 x = 0.91 (2,000 \text{ lbs.})$
 $0.36 x = 1,820 \text{ lbs.}$
 $x = 1,820 \text{ lbs.} / 0.36 = 5,056 \text{ lbs.}$
9. Let x = number of lbs. of 8 % digestible feed
Let $(100 \text{ lbs.} - x)$ = number of lbs. of 23 % digestible protein feed
 $8 \% (x) + 23 \% (100 \text{ lbs.} - x) = 8.5 \% (100 \text{ lbs.})$
 $(0.08)(x) + (0.23)(100 \text{ lbs.} - x) = (0.085)(100 \text{ lbs.})$
 $0.08 x + 23 \text{ lbs.} - 0.23 x = 8.5 \text{ lbs.}$
 $- 0.15 x = - 14.5 \text{ lbs.}$
 $x = - 14.5 \text{ lbs.} / - 0.15 = 96.7 \text{ lbs.}$

Continued on page 28

SIMPLE EQUATIONS
Solutions

Agriculture

9. Continued.

$$(100 \text{ lbs.} - x) = (100 \text{ lbs.} - 96.7 \text{ lbs.}) = 3.3 \text{ lbs.}$$

Thus 96.7 lbs. of 8 % digestible protein and 3.3 lbs. of 23 % digestible protein.

10. Consider data for 100 lbs. of fertilizer:

Let $4x$ = the number of pounds of nitrogen in 100 lbs. of fertilizer.
Then $4x/0.26$ = the number of pounds of cyanamid required to furnish $4x$ lbs. of nitrogen.

Let $5x$ = the number of pounds of phosphoric acid in 100 lbs. of fertilizer.

Then $5x/0.30$ = the number of pounds of superphosphate required to furnish $5x$ lbs. of phosphoric acid.

Let $2x$ = the number of pounds of muriate of potash to furnish the 100 lbs. of fertilizer.

Then $2x/0.24$ = the number of pounds of muriate of potash to furnish the $2x$ lbs. of potash.

$$\text{Thus: } (4x/0.26) + (5x/0.30) + (2x/0.24) = 100 \text{ lbs.}$$

$$1560 ((400x/26) + (500x/30) + (200x/24)) = (100 \text{ lbs.})(1560)$$

$$24,000x + 26,000x + 13,000x = 156,000 \text{ lbs.}$$

$$63,000x = 156,000 \text{ lbs.}$$

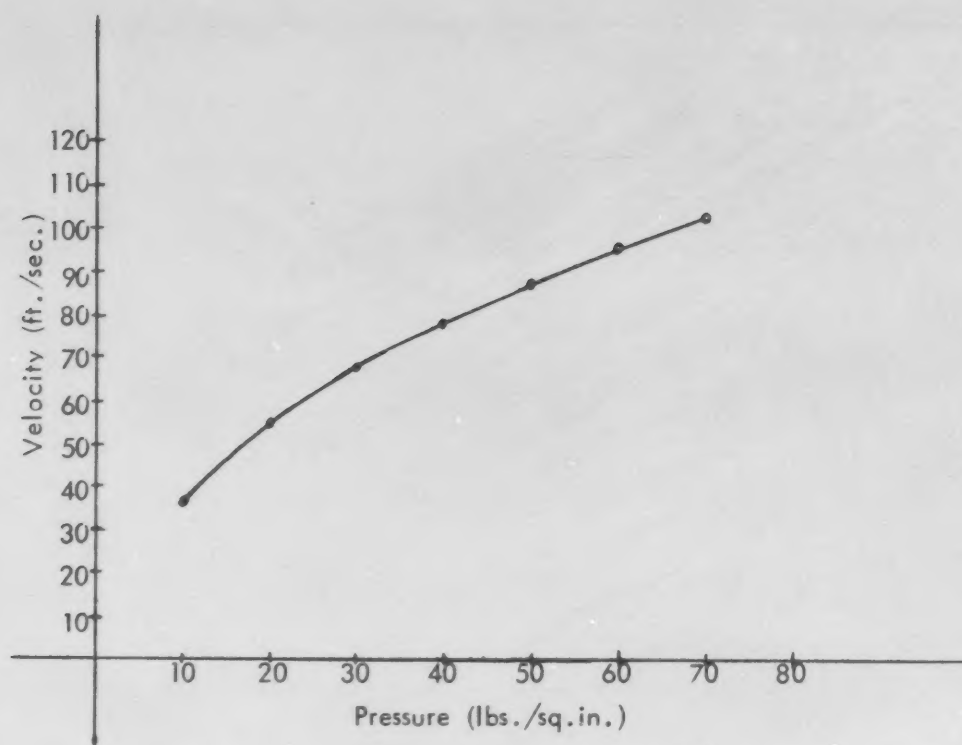
$$x = 156,000 \text{ lbs.}/63,000$$

$$x = 2.48 \text{ lbs. approx.}$$

x must be a whole number, so $x = 2$

Thus 8 lbs. nitrogen, 10 lbs. phosphoric acid and 4 lbs. potash or
8-10-4

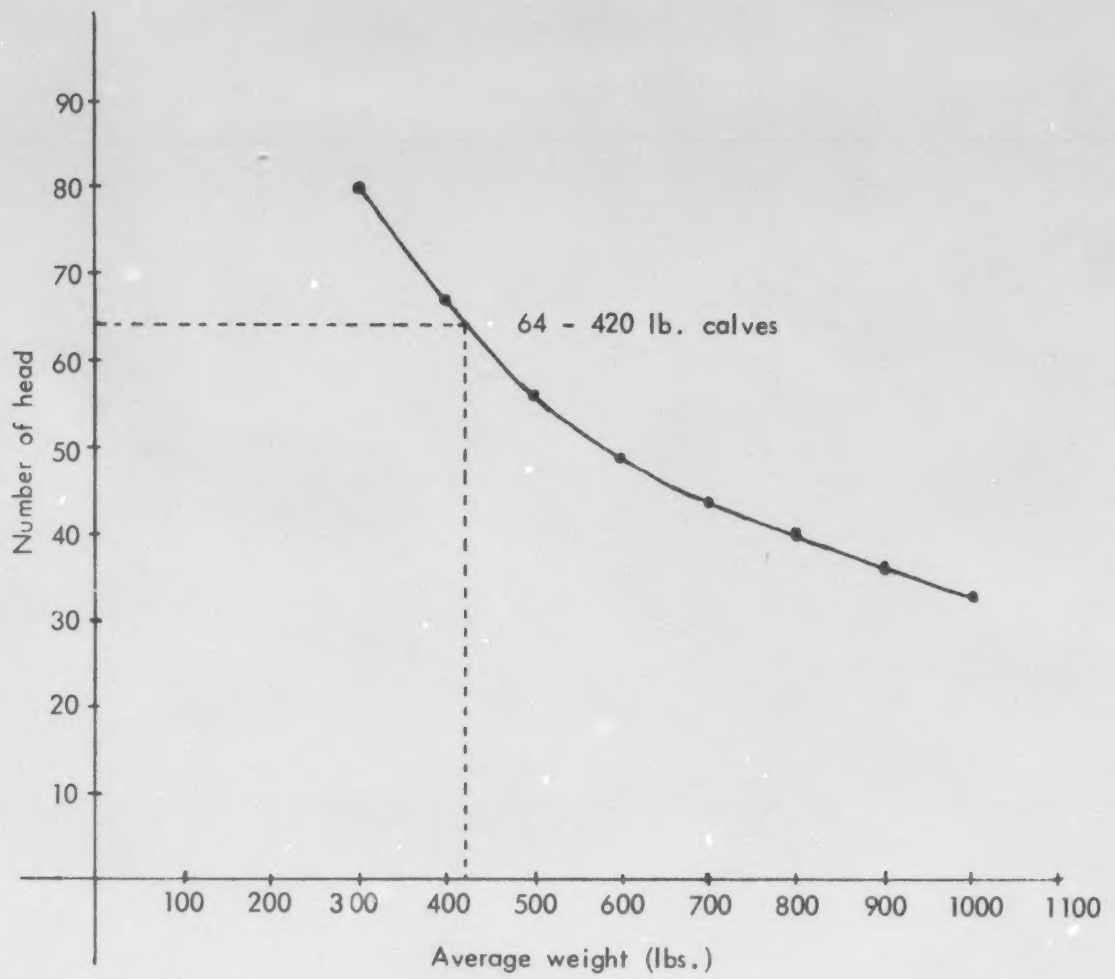
1.



CHARTS AND GRAPHS
Solutions

Agriculture

2.



AG Sol-30

CHARTS AND GRAPHS
Solutions

Agriculture

3. $(8,450 \text{ steers})(950 \text{ lbs./steer})(8.5 \text{ tons}/1,000 \text{ lbs.}) = 68,234 \text{ tons}$
 $(5,600 \text{ lambs})(85 \text{ lbs./lamb})(7.5 \text{ tons}/1,000 \text{ lbs.}) = 3,750 \text{ tons}$
Nitrogen: $(68,234 \text{ tons})(14.6 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) + (3,750 \text{ tons})(21.5 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) = 498 + 40 = 538 \text{ tons}$
Phosphorus: $(68,234 \text{ tons})(4.2 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) + (3,750 \text{ tons})(6.3 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) = 143 + 12 = 155 \text{ tons}$
Potash: $(68,234 \text{ tons})(9.2 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) + (3,750 \text{ tons})(22.0 \text{ lbs./ton})(1 \text{ ton}/2,000 \text{ lbs.}) = 314 + 41 = 355 \text{ tons}$
4. (a) 69 horsepower (b) 27 horsepower
(c) 4.4 % slip (d) 2.0 % slip
(e) 86 horsepower
5. (a) 86 horsepower (b) 40 horsepower
(c) 39 % slip (d) 12 % slip
(e) 92 horsepower
6. (a) Nitrogen: $50 \text{ lbs.} + 20 \text{ lbs.} = 70 \text{ lbs.}$
Phosphate: $25 \text{ lbs.} + 5 \text{ lbs.} = 30 \text{ lbs.}$
Potash: $15 \text{ lbs.} + 35 \text{ lbs.} = 50 \text{ lbs.}$
(b) Nitrogen: $(90 \text{ lbs.})(150 \text{ lb.}/100 \text{ lb.}) = 135 \text{ lbs.}$
Phosphate: $(35 \text{ lbs.})(150 \text{ lb.}/100 \text{ lb.}) = 52.5 \text{ lbs.}$
Potash: $(25 \text{ lbs.})(150 \text{ lb.}/100 \text{ lb.}) = 37.5 \text{ lbs.}$
(c) Nitrogen: $(30 \text{ lbs.})(4,800 \text{ lbs.}/3,000 \text{ lbs.}) + (50 \text{ lbs.})(58 \text{ lb.}/60 \text{ lb.})$
 $= 48 \text{ lbs.} + 48 \text{ lbs.} = 96 \text{ lbs.}$
Phosphate: $(10 \text{ lbs.})(4,800 \text{ lbs.}/3,000 \text{ lbs.}) + (25 \text{ lbs.})(58 \text{ lb.}/60 \text{ lb.})$
 $= 16 \text{ lbs.} + 24 \text{ lbs.} = 40 \text{ lbs.}$
Continued on page 32

CHARTS AND GRAPHS
Solutions

Agriculture

6. Continued.

$$\text{Potash: } (15 \text{ lbs.})(4,800 \text{ lbs.}/3,000 \text{ lbs.}) + (15 \text{ lbs.})(58 \text{ bu.}/60 \text{ bu.}) \\ = 24 \text{ lbs.} + 14.5 \text{ lbs.} = 38.5 \text{ lbs.}$$

7. 100, 50 lb. pigs need:

$$\text{Dry matter } 100 (2.6 \text{ to } 3.2) = 260 \text{ lbs. to } 320 \text{ lbs.}$$

$$\text{Digestible Protein } 100(0.37 \text{ to } 0.45) = 37 \text{ lbs. to } 45 \text{ lbs.}$$

$$\text{T.D.N. } 100 (2.2 \text{ to } 2.6) = 220 \text{ lbs. to } 260 \text{ lbs.}$$

	Dry Matter	Dig. Protein	T.D.N.
250 lbs. shelled corn	212.5 lbs.	16.75 lbs.	200.25 lbs.
50 lbs. tankage	46.4 lbs.	25.25 lbs.	32.90 lbs.
20 lbs. alfalfa meal	18.1 lbs.	2.18 lbs.	10.14 lbs.
320 lbs. total	277.0 lbs.	44.18 lbs.	243.29 lbs.

Yes, all within the requirements.

8. Steers	(a) 8.26	(b) 9.92	(c) 12.26	(d) 14.76
Hogs	(a) 3.29	(b) 3.63	(c) 4.00	(d) 4.39
Lambs	(a) 5.50	(b) 6.44	(c) 8.50	(d) 10.86

ADVANCED EQUATIONS
Solutions

Agriculture

$$\begin{aligned}
 1. \quad & (2,600 \text{ ft.})(1,250 \text{ ft.}) = 3,250,000 \text{ sq. ft.} \\
 & 1/2 \times 3,250,000 = 1,625,000 \\
 & (2,600 - 2x)(1,250 - 2x) = 1,625,000 \\
 & 3,250,000 - 7,700x + 4x^2 = 1,625,000 \\
 & 4x^2 - 7,700x + 1,625,000 = 0 \\
 & 4(x^2 - 1,925x + 406,250) = 0 \\
 & -b \pm \sqrt{b^2 - 4ac} / 2a \qquad 1,925 \pm \sqrt{3,705,625 - 1,625,000} / 2 \\
 & 1,925 \pm \sqrt{1,442.43} / 2 = 241 \text{ or } 1,683.7
 \end{aligned}$$

The uniform strip to be plowed must be 241 ft. wide since 1,683.7 would form negative dimensions.

$$\begin{aligned}
 2. \quad & \$27,648. = \text{cost of sheep} \qquad \text{Let } x = \text{number of sheep.} \\
 & \text{one sheep cost } \$27,648./x \\
 & (x - 5)(\$27,648/x + \$3.) = \$27,648. + \$2,417. \\
 & \$27,648. + 3x - \$138,240/x - 15 = \$30,065. \\
 & -2,432 + 3x - \$138,240/x = 0 \\
 & 3x^2 - 2,432x - \$138,240 = 0 \\
 & x = 2,432 \pm \sqrt{5,914,624 + 1,658,880} / 6 \\
 & = 2,432 \pm 2,752 / 6 = 864 \text{ sheep were bought}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 2x + y = 2,000 \\
 & y = 2,000 - 2x \\
 & xy = \text{max. area} \\
 & x(2,000 - 2x) = \text{max. area} \\
 & 2,000x - 2x^2 = \text{area}
 \end{aligned}$$

To find the x which has the largest area substitute in values for x, thus the max. area is when x = 500

Continued on page 34

ADVANCED EQUATIONS
Solutions

Agriculture

3.

x	0	100	200	300	400	500
Area	0	180,000	320,000	420,000	480,000	500,000
x	600	700	800	900	1,000	
Area	480,000	420,000	320,000	180,000	0	

$$2(500) + y = 2,000$$

$$1,000 + y = 2,000$$

$$y = 1,000$$

4. P = cost of pears Let r = %

A = cost of apples

$$P + A = \$1120$$

$$P(1 + r) = \$278.10$$

$$A(1 - r) = \$824.50$$

$$(1120 - P)(1 - r) = \$824.50$$

$$(1120 - 1120r - P + Pr)$$

$$= \$824.50$$

$$A = 1120 - P$$

$$P + Pr = 278.10$$

$$-P + Pr - 1120r = -295.50$$

$$2Pr - 1120r = -17.40$$

$$r(P - 560) = -8.7$$

$$r = -8.7/(P - 560)$$

$$\text{therefore: } P + P[-8.7/(P - 560)] = 278.10$$

$$P(P - 560) + P(-8.7) = 278.10(P - 560)$$

$$P^2 - 560P - 8.7P = 278.10P - 155,736$$

$$P^2 - 846.8P + 155,736 = 0$$

$$P = 846.8 \pm \sqrt{717070.24 - 622,944} / 2$$

$$= 846.8 \pm 306.8 / 2 = \$270.$$

$$A = \$850. \quad r = -17.4/[2(270) - 1120] = 0.03 = 3\%$$

5. 780 gal. (1 cu.ft./7.48 gal.) = 104.3 cu.ft.

$$104.3 \text{ cu.ft.} = \pi r^2 \cdot 128 \text{ inches (1 ft./12 in.)}$$

Continued on page 35

ADVANCED EQUATIONS
Solutions

Agriculture

5. Continued.

$$104.3 \text{ cu.ft.} / [\pi (10.67 \text{ ft.})] = r^2$$

$$3.1124 = r^2$$

$$r = 1.764$$

$$d = 3.5 \text{ ft.}$$

$$6. D^2 = (142 \text{ inches})^2 + (42.75 \text{ inches})^2$$

$$D^2 = 20,164 \text{ sq.inches} + 1,827.56 \text{ sq.inches}$$

$$D^2 = 21,991.56 \text{ square inches}$$

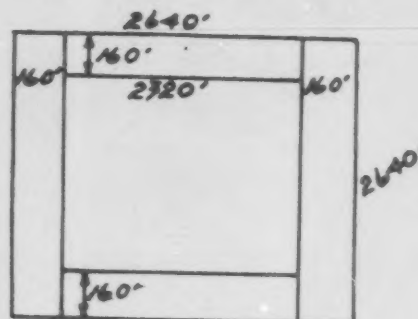
$$D = \sqrt{21,991.56 \text{ square inches}}$$

$$D = 148.3 \text{ inches}$$

PERIMETER AND AREA
Solutions

Agriculture

1. 160 acres = $1/4$ section (sq. miles), therefore $1/2$ mile on each side.



- $$\begin{aligned} (1/2)(5,280 \text{ ft.}) &= 2,640 \text{ ft.} \\ (2,640 \text{ ft.})(160 \text{ ft.})(2) &= 844,800 \text{ sq. ft.} \\ (2,320 \text{ ft.})(160 \text{ ft.})(2) &= 742,400 \text{ sq. ft.} = 1,587,200 \text{ sq. ft.} \\ (1,587,200 \text{ sq. ft.})(0.95) &= (1,507,840 \text{ sq. ft.})(1 \text{ acre}/43,560 \text{ sq. ft.}) \\ &= 34.6 \text{ acres} \end{aligned}$$
2. $[(106 \text{ ft.})(94 \text{ ft.})] - 1,400 \text{ sq. ft.} = 9,964 \text{ sq. ft.} - 1,400 \text{ sq. ft.}$
 $= (8,564 \text{ sq. ft.})(0.3 \text{ lbs.}/100 \text{ sq. ft.}) = 25.7 \text{ lbs.}$
3. Posts:
 $200 \text{ ft.}/(10 \text{ ft.}/\text{space}) = 20 \text{ spaces, therefore 21 posts}$
 $(4 \text{ in.})(6 \text{ in.})(6 \text{ ft.})/12 = (12 \text{ board-feet/post})(21 \text{ posts})(36\text{¢}/\text{board ft.})$
 $= \$90.72$
- Rails:
 $(2 \text{ in.})(6 \text{ in.})(10 \text{ ft.})/12 = (10 \text{ board-feet/board})(4 \text{ boards/space})(20 \text{ spaces})$
 $(28\text{¢}/\text{board ft.})$
 $= \$224.00$
- Total = $\$90.72 + \$224.00 = \$314.72$

PERIMETER AND AREA
Solutions

Agriculture

4. Length = (circumference/turn)(turns)
 $(12.1 \text{ ft./turn})(30 \text{ turns}) = 363 \text{ feet}$
Width = (number of drops)(distance between drops)
 $(18)(8 \text{ inches})(1 \text{ ft./12 inches}) = 12 \text{ feet}$
Area = (length)(width)
 $(363 \text{ ft.})(12 \text{ ft.}) = (4,356 \text{ sq.ft.})(1 \text{ acre}/43,560 \text{ sq.ft.}) = 0.1 \text{ acres}$
 $(6.4 \text{ lbs.}/0.1 \text{ acre})(1 \text{ bu}/32 \text{ lbs.}) = 2 \text{ bu/acres}$
5. Ten 16 in. moldboard bottoms = 160 inches
 $160 \text{ in.}(1 \text{ ft.}/12 \text{ in.}) = 13 \frac{1}{3} \text{ ft.}$
 $3.8 \text{ mph}(5,280 \text{ ft./mile}) = 20,064 \text{ ft./hour}$
 $13.33 \text{ ft.}(20,064 \text{ ft./hour})(1 \text{ acre}/43,560 \text{ sq.ft.}) = 6.14 \text{ acre/hour}$
 $(160 \text{ in.})(5.8 \text{ in.})(9 \text{ lbs./sq.in.}) = 8,352 \text{ lbs.}$
 $(10 \text{ hours})(0.78)(6.14 \text{ acres/hour}) = 47.9 \text{ acres}$
6. $(160 \text{ in.})(1 \text{ ft.}/12 \text{ in.}) = 13 \frac{1}{3} \text{ ft.}$
 $(5.3 \text{ mph})(5,280 \text{ ft./mile}) = 27,984 \text{ ft./hour}$
 $(27,984 \text{ ft/hr})(13 \frac{1}{3} \text{ ft})(1 \text{ acre}/43,560 \text{ sq.ft.}) = 8.56 \text{ acre/hour}$
 $(8.56 \text{ acre/hour})(10 \text{ hours})(0.75) = 64.24 \text{ acres}$
7. Formula needed: $\pi dh = A$ $F = AP$
 $\pi (10 \text{ in.})(16 \text{ in.})(26 \text{ lbs./sq.in.}) = 2,042 \text{ lbs.}$
8. Plants per row: $(300 \text{ ft.})(1 \text{ plant}/2 \frac{1}{2} \text{ ft.}) = 120 \text{ plants}$
Total plants: $(120 \text{ plants/row})(60 \text{ rows}) = 7,200 \text{ plants}$
9. Area = $\pi D^2 / 4 = (3.1416)(4 \frac{1}{4} \text{ in.})^2 / 4 = 14.19 \text{ sq.in.}$
Force = (Pressure)(Area)
 $(1,845 \text{ lbs./sq.in.})(14.19 \text{ sq.in.}) = 26,180.55 \text{ lbs.}$

PERIMETER AND AREA
Solutions

Agriculture

10. $(270 \text{ rev./min.})(3.1416)(8 \text{ in./rev.})(60 \text{ min./1 hour})(1 \text{ ft./12 in.})$
 $(1 \text{ mile/5,280 ft.}) = 6,426 \text{ miles/hr.}$

11. $C/2 = \pi d/2 = (3.1416)(3.6 \text{ in.}) / 2 = 5.7 \text{ inches}$
 $5.7 \text{ inches} + 2.0 \text{ inches} = 7.7 \text{ inches wide}$
 $(270 \text{ ft.})(7.7 \text{ in.})(1 \text{ ft./12 in.}) = 173.3 \text{ sq. ft.}$

12. Area of tank and platform:
 $\pi D^2 / 4 = (3.1416)(38 \text{ ft.})^2 / 4 = 1,134 \text{ sq. ft.}$
Area of tank only:
 $(3.1416)(30 \text{ ft.})^2 / 4 = 707 \text{ sq. ft.}$
Area of platform = $1,134 \text{ sq. ft.} - 707 \text{ sq. ft.} = 427 \text{ sq. ft.}$

VOLUME
Solutions

Agriculture

1. Volume = (length)(width)(depth)
 $\text{Volume} = (80 \text{ ft.})(24 \text{ ft.})(1 \frac{1}{4} \text{ ft.})(1 \text{ cu.yd.}/27 \text{ cu.ft.}) = 88.9 \text{ cu.yd.}$

2. Volume = (200 ~~acres~~)(2 ~~in.~~)(43,560 sq.ft./1 ~~acre~~)(1 ft./12 ~~in.~~)
 $= 1,452,000 \text{ cu.ft.}$
 $(1,452,000 \text{ cu.ft.})(7.5 \text{ gal./cu.ft.}) \div (12,400 \text{ gal./min.})$
 $= (1,452,000 \text{ cu.ft.})(7.5 \text{ gal./cu.ft.})(1 \text{ min.}/12,400 \text{ gal.})$
 $= 878 \text{ min. or } 14 \text{ hr. } 38 \text{ min.}$

3. Days from Nov. 1st to March 20th = 30 Nov., 31 Dec., 31 Jan.,
 28 Feb., 20 Mar.
 $(800 \text{ head})(140 \text{ days})(40 \text{ lbs.}) / (\text{day/head}) = 4,480,000 \text{ lbs.}$
 $(4,480,000 \text{ lbs.})(1 \text{ ton}/2,000 \text{ lbs.}) = 2,240 \text{ tons}$
 $(16 \text{ inches})(18 \text{ inches})(3 \text{ feet})(1 \text{ sq.ft.}/144 \text{ sq.in.}) = 6.0 \text{ cu.ft.}$
 $(6.0 \text{ cu.ft.}/95 \text{ lbs.})(4,480,000 \text{ lbs.}) = 282,950 \text{ cu.ft.}$

4. $\pi r^2 h = V$
 $\pi (10 \text{ ft.})^2 (50 \text{ ft.}) = 15,708 \text{ cu.ft.}$
 $(396 \text{ tons})(2,000 \text{ lbs./ton}) = 792,000 \text{ lbs.}$
 $792,000 \text{ lbs.}/15,708 \text{ cu.ft.} = 50.4 \text{ lbs./cu.ft.}$

5. $V = \pi r^2 h$
 $= \pi (15 \text{ in.}/8)^2 (99.75 \text{ in.})(1 \text{ cu.ft.}/1728 \text{ cu.in.})(510 \text{ lb./cu.ft.})$
 $= 325 \text{ lbs.}$

6. Weight = (Volume)(Weight/Volume)
 $W = (0.85) \pi (5/2 \text{ ft.})^2 (10 \text{ ft.})(7.48 \text{ gal./cu.ft.})(9.2 \text{ lbs./gal.})$
 $W = 11,485 \text{ lbs.}$

VOLUME
Solutions

Agriculture

7. $V = (b_1 + b_2 / 2) hL$
 $(10 \text{ ft.} + 15 \text{ ft.} / 2)(10 \text{ ft.})(30 \text{ ft.}) = 3,750 \text{ cu.ft.}$
 $(3,750 \text{ cu.ft.})(7.48 \text{ gal/cu.ft.}) = 28,050 \text{ gal.}$
 $(28,050 \text{ gal.})(1 \text{ min} / 50 \text{ gal.})(1 \text{ hr.} / 60 \text{ min}) = 9.35 \text{ hour}$

8. $\pi r^2 h = V$
 $5 \text{ in.} / 7.8 \text{ in.} = 64 \%$
 $64 \% (\pi)(0.325 \text{ ft.})^2 (13 \text{ ft.})(7.48 \text{ gal./cu.ft.}) = 20.6 \text{ gal.}$

9. $\pi (0.354 \text{ ft.})^2 (4.25 \text{ ft./sec.})(7.48 \text{ gal./cu.ft.}) = 12.5 \text{ gal./sec.}$

10. $(16 \text{ in.})(20 \text{ in.})(40 \text{ in.})(1 \text{ cu.ft.} / 1,728 \text{ cu.in.}) = 7.407 \text{ cu.ft.}$
 $(100 \text{ ft.})(24 \text{ ft.})(21 \text{ ft.}) = 50,400 \text{ cu.ft.}$
 $(50,400 \text{ cu.ft.})(90 \text{ lbs.} / 7.407 \text{ cu.ft.})(1 \text{ ton} / 2,000 \text{ lbs.}) = 306 \text{ tons}$

11. $V = \pi r^2 h$
 $V = 4/3 \pi r^3$
 $\pi (2.375 \text{ ft.})^2 (15.2 \text{ ft.}) + 4/3 \pi (2.375 \text{ ft.})^3$
 $269.4 \text{ cu.ft.} + 56.1 \text{ cu.ft.} = 325.5 \text{ cu.ft.}$

VOLUME
Solutions

Agriculture

12. Volume: (cross section area)(length)

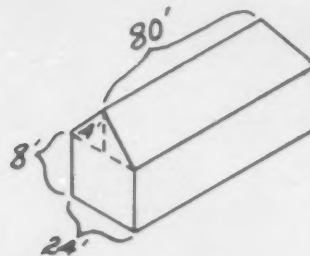
$$[(24 \text{ ft.})(8 \text{ ft.}) + (1/2)(24 \text{ ft.})(4 \text{ ft.})] (80 \text{ ft.})$$

$$= [(192 \text{ sq.ft.}) + (48 \text{ sq.ft.})] (80 \text{ ft.})$$

$$= (240 \text{ sq.ft.})(80 \text{ ft.}) = 19,200 \text{ cu.ft.}$$

$$\text{Amount of Phosphate: } (19,200 \text{ cu.ft.})(1 \text{ lb.}/12,000 \text{ cu.ft.})$$

$$= 1.6 \text{ lbs.}$$



13. $V = \pi r^2 h$

$$= \pi (7.5 \text{ ft.})^2 (20 \text{ ft.}) = 3,534.3 \text{ cu.ft.}$$

$$(3,534.3 \text{ cu.ft.})(1 \text{ bushel}/1.244 \text{ cu.ft.})(1 \text{ min.}/20 \text{ bushels})$$

$$= 142 \text{ minutes}$$

RIGHT TRIANGLE TRIGONOMETRY

Solutions

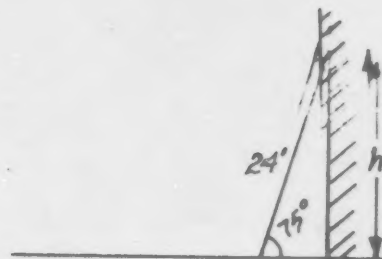
Agriculture

$$1. \sin 75^\circ = h/24 \text{ ft.}$$

$$24 \text{ ft.} \sin 75^\circ = h$$

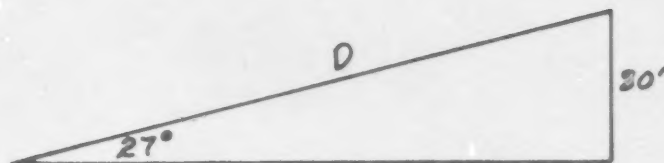
$$(24 \text{ ft.})(0.9059) = h$$

$$23.2 \text{ feet} = h$$



$$2. \sin 27^\circ = 80/D$$

$$D = 80/\sin 27^\circ = 80/0.4540 = 176 \text{ ft. approx.}$$



$$3. \tan A = 1,050 \text{ ft.}/1,835 \text{ ft.}$$

$$\tan A = 0.5722$$

$$A = 30^\circ \text{ approx.}$$

$$4. 360^\circ/12 = 30^\circ$$

Using Law of Cosines:

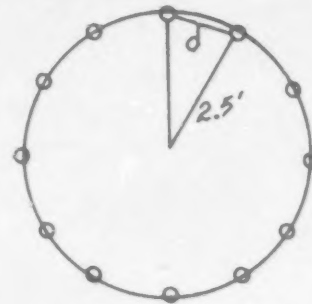
$$d = \sqrt{a^2 + b^2 - 2ab \cos D}$$

$$d = \sqrt{(2.5 \text{ ft.})^2 + (2.5 \text{ ft.})^2 - 2(2.5 \text{ ft.})(2.5 \text{ ft.})(0.8660)}$$

$$d = \sqrt{6.25 \text{ ft.}^2 + 6.25 \text{ ft.}^2 - 10.825 \text{ ft.}^2}$$

$$d = \sqrt{1.675 \text{ ft.}^2}$$

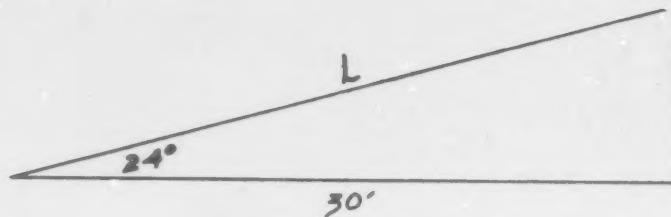
$$d = (1.29 \text{ ft.})(12 \text{ in.}/1 \text{ ft.}) = 15.5 \text{ inches}$$



RIGHT TRIANGLE TRIGONOMETRY
Solutions

Agriculture

5.



$$\cos 24^\circ = 30 \text{ ft.}/L$$

$$L = 30 \text{ ft.}/\cos 24^\circ = 30 \text{ ft.}/0.9135$$

$$L = 32.84 \text{ ft.}$$

6. $\tan 77^\circ = H/35 \text{ ft.}$

$$(35 \text{ ft.})(\tan 77^\circ) = H$$

$$(35 \text{ ft.})(4.3315) = H$$

$$151.6 \text{ feet} = H$$

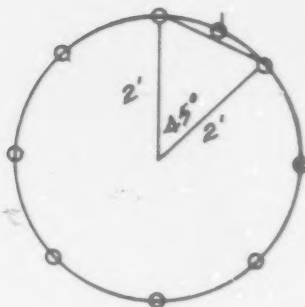
$$\cos 77^\circ = 35 \text{ ft.}/D$$

$$D = 35 \text{ ft.}/\cos 77^\circ$$

$$D = 35 \text{ ft.}/0.2250$$

$$D = 155.6 \text{ ft.}$$

7.



$$360^\circ/8 = 45^\circ$$

Using Law of Cosines:

$$d = \sqrt{a^2 + b^2 - 2ab \cos D}$$

$$d = \sqrt{(2 \text{ ft.})^2 + (2 \text{ ft.})^2 - 2(2 \text{ ft.})(2 \text{ ft.})(0.707)}$$

$$d = \sqrt{4 \text{ ft.} + 4 \text{ ft.} - 5.656 \text{ ft.}^2}$$

$$d = \sqrt{2.344 \text{ ft.}^2} = (1.53 \text{ ft.})(12 \text{ in./ft.}) = 18.4 \text{ inches}$$

EXPONENTS AND LOGARITHMS
Solutions

Agriculture

$$1. \quad S = (1024.6 \text{ ft.} + 2104.3 \text{ ft.} + 2359.9 \text{ ft.}) / 2 \\ = 5488.8 \text{ ft.} / 2 = 2744.4 \text{ ft.}$$

$$A = \sqrt{\frac{(2744.4 \text{ ft.})(2744.4 - 1024.6 \text{ ft.})(2744.4 - 2104.3 \text{ ft.})(2744.4 - 2359.9 \text{ ft.})}{43,560 \text{ sq.ft./acre}}}$$

$$A = \sqrt{\frac{(2744.4 \text{ ft.})(1719.8 \text{ ft.})(640.1 \text{ ft.})(384.5 \text{ ft.})}{43,560 \text{ sq.ft./acre}}}$$

$$\log 2744.4 = 3.43845$$

$$+ \log 1719.8 = 3.23548$$

$$+ \log 640.1 = 2.80625$$

$$+ \log 384.5 = 2.58490$$

$$\log R = 12.06508$$

$$2 = 6.03254$$

$$- \log 43,560 = 4.63909$$

$$\log A = 1.39345$$

$$A = 24.743 \text{ acres}$$

$$2. \quad \text{Area} = \frac{[(834 \text{ ft.})(1824 \text{ ft.})(\sin 52^\circ)] / 2}{43,560 \text{ sq.ft./acre}}$$

$$\log 834 = 2.92117$$

$$\log 1824 = 3.26102$$

$$+ \log \sin 52^\circ = 9.89653 - 10$$

$$\log N = 6.07872$$

$$- \log 2 = 0.30103$$

$$\log A \text{ in ft} = 5.77769$$

$$- \log 43560 = 4.63909$$

$$\log A \text{ in} \\ \text{acres} = 1.13860$$

$$\text{Area} = 13.76 \text{ acres}$$

EXPONENTS AND LOGARITHMS
Solutions

Agriculture

3. $\text{Area} = \pi r^2$

$(10 \text{ acres})(43,560 \text{ ft.}/1 \text{ acre}) = 435,600 \text{ sq. ft.}$

$435,600 \text{ sq. ft.} = (3.1416)(r)^2$

$435,600 \text{ sq. ft.}/3.1416 = r^2$

$138,655.46 \text{ sq. ft.} = r^2$

$372.4 \text{ ft.} = r$

4. $S = (512.4 \text{ ft.} + 602.4 \text{ ft.} + 600.0 \text{ ft.}) / 2$

$= 1714.8 \text{ lbs.}/2 = 857.4 \text{ lbs.}$

$$A = \sqrt{\frac{(857.4 \text{ ft.})(857.4 - 512.4 \text{ ft.})(857.4 - 602.4 \text{ ft.})(857.4 - 600.0 \text{ ft.})}{43,560 \text{ sq. ft./acre}}}$$

$$A = \sqrt{\frac{(857.4 \text{ ft.})(345.0 \text{ ft.})(255.0 \text{ ft.})(257.4 \text{ ft.})}{43,560 \text{ sq. ft./acre}}}$$

$\log 857.4 = 2.93318$

$\log 345.0 = 2.53782$

$\log 255.0 = 2.40654$

$\log 257.4 = 2.41061$

$\log R = 10.28815$

$2 = 5.14408$

$-\log 43560 = 4.63909$

$\log A = 0.50499$

$A = 3.199 \text{ acres}$

5. $\text{Number} = (5,255 \text{ gal/min})(1 \text{ ac. ft.}/7.48 \text{ gal})(1 \text{ acre}/43,560 \text{ sq. ft.})$
 $(60 \text{ min}/1 \text{ hr.})(24 \text{ hr.})$

$\log 5,255 = 3.72057$

$+\log 60 = 1.77815$

$+\log 24 = 1.38021$

$\log N = 6.87893$

$\log D = 5.51299$

$\log \text{No.} = 1.36595$

$\log 7.48 = 0.87390$

$+\log 43560 = 4.63909$

$\log D = 5.51299$

$\text{No.} = 23.22 \text{ acre feet}/24 \text{ hours}$

EXPONENTS AND LOGARITHMS
Solutions

Agriculture

6. $V = \frac{4}{3} \pi r^3$

$(\frac{4}{3})(3.1416)(10.15 \text{ ft.})^3 (7.48 \text{ gal/1 cu.ft.})$

$\log 4 = 0.60206$

$+\log 3.1416 = 0.49715$

$+3 \log 10.15 = 3.01941$

$+\log 7.48 = 0.87390$

$\log N = 4.99251$

$\log 3 = 0.47712$

$\log V = 4.51539$

$V = 32763 \text{ gals. or approx. } 32,900 \text{ gals}$

7. $A = (154.8 \text{ acres})(43,560 \text{ sq.ft./1 acre})(1 \text{ ft./12})(7.5 \text{ gals/1 cu.ft.})$
 $(1 \text{ min./1,780 gal.})(1 \text{ hr./60 min.})$

$\log 154.8 = 2.18977$

$+\log 43560 = 4.63909$

$+\log 7.5 = 0.87506$

$\log N = 7.70392$

$\log D = 6.10775$

$\log A = 1.59617$

$A = 39.46 \text{ hours or approx. } 40 \text{ hours.}$

$\log 12 = 1.07918$

$\log 1780 = 3.25042$

$\log 60 = 1.77815$

$\log D = 6.10775$

8. $V = (138)(0.135)^{2/3} (0.0015)^{1/2}$

$\log 138 = 2.13988$

$+ \frac{2}{3} \log 0.135 = 9.42022 - 10$

$+ \frac{1}{2} \log 0.0015 = 8.58805 - 10$

$\log V = 20.14815 - 20$

$V = 1.406 \text{ ft./sec.}$

AG Sol-46

EXPONENTS AND LOGARITHMS
Solutions

Agriculture

9. (a) $1 = 3.5 (120)^{.64}$
 $1 = 3.5 / (120)^{.64}$

$\log 3.5$	$= 10.54407 - 10$
$\log 120$	$= 1.33068$
$\log 1$	$= 9.21339 - 10$
1	$= .1630$

(b) $0.3 = 3.5 T^{.65}$
 $0.3/3.5 = 1/T^{.65}$
 $3.5/0.3 = T^{.65}$
 $\sqrt[.65]{3.5/0.3} = T$

$\log 3.5$	$= 10.54407 - 10$
$-\log 0.3$	$= 9.47712 - 10$
$\log R$	$= 1.06695$
$.64$	$= 1.66711$
T	$= 46.46 \text{ min.}$
or	46.5 min.

10. $V = 1/3 r^2 h$

$W = (1/3)(3.1416)(34.25 \text{ ft.})^2 (80 \text{ ft.})(48 \text{ lbs./cu.ft.})(1 \text{ ton}/2,000 \text{ lbs.})$

$\log 3.1416$	$= 0.49715$
$+ 2 \log 34.25$	$= 3.06932$
$+ \log 80$	$= 1.90309$
$+ \log 48$	$= 1.68124$
$\log N$	$= 7.15080$

$\log 2$	$= 0.47712$
$+ \log 2,000$	$= 3.30103$
$\log D$	$= 3.77815$

$\log N$	$= 7.15080$
$\log D$	$= 3.77815$
$\log W$	$= 3.37265$

$W = 2358.6 \text{ ton or approx. } 2,360 \text{ ton}$

11. $a^2 + b^2 = c^2$

$(8 \text{ ft.})^2 + (b)^2 = (24 \text{ ft.})^2$

$64 \text{ ft.}^2 + b^2 = 576 \text{ ft.}^2$

$b = \sqrt{576 \text{ ft.}^2 - 64 \text{ ft.}^2} = 512 \text{ ft.}$

$b = 22.63 \text{ ft.}$

AG Sol-47